Internal Use Only

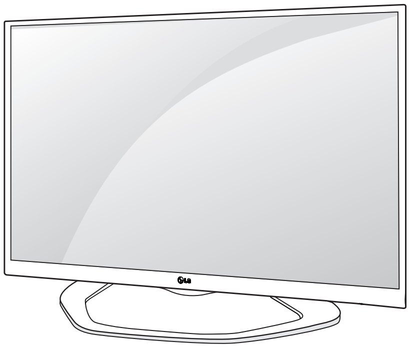
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LED TV
SERVICE MANUAL

CHASSIS : LD33B

MODEL : 60LN57** 60LN57**-ZE

CAUTION
BEFORE SERVICING THE CHASSIS,
READ THE SAFETY PRECAUTIONS IN THIS MANUAL.



P/NO : MFL67727131 (1305-REV00)
Printed in Korea

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SAFETY PRECAUTIONS

IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by ⚠ in the Schematic Diagram and Exploded View.
It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent Shock, Fire, or other Hazards.
Do not modify the original design without permission of manufacturer.

General Guidance

An **isolation Transformer should always be used** during the servicing of a receiver whose chassis is not isolated from the AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks.

It will also protect the receiver and it's components from being damaged by accidental shorts of the circuitry that may be inadvertently introduced during the service operation.

If any fuse (or Fusible Resistor) in this TV receiver is blown, replace it with the specified.

When replacing a high wattage resistor (Oxide Metal Film Resistor, over 1 W), keep the resistor 10 mm away from PCB.

Keep wires away from high voltage or high temperature parts.

Before returning the receiver to the customer,

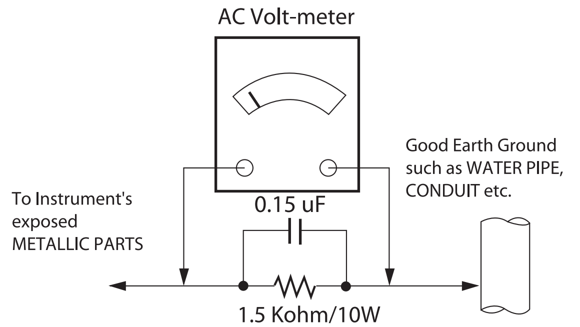
always perform an **AC leakage current check** on the exposed metallic parts of the cabinet, such as antennas, terminals, etc., to be sure the set is safe to operate without damage of electrical shock.

Leakage Current Cold Check(Antenna Cold Check)
With the instrument AC plug removed from AC source, connect an electrical jumper across the two AC plug prongs. Place the AC switch in the on position, connect one lead of ohm-meter to the AC plug prongs tied together and touch other ohm-meter lead in turn to each exposed metallic parts such as antenna terminals, phone jacks, etc.
If the exposed metallic part has a return path to the chassis, the measured resistance should be between 1 MΩ and 5.2 MΩ.
When the exposed metal has no return path to the chassis the reading must be infinite.
An other abnormality exists that must be corrected before the receiver is returned to the customer.

Leakage Current Hot Check (See below Figure)
Plug the AC cord directly into the AC outlet.

Do not use a line Isolation Transformer during this check.
Connect 1.5 K / 10 watt resistor in parallel with a 0.15 uF capacitor between a known good earth ground (Water Pipe, Conduit, etc.) and the exposed metallic parts.
Measure the AC voltage across the resistor using AC voltmeter with 1000 ohms/volt or more sensitivity.
Reverse plug the AC cord into the AC outlet and repeat AC voltage measurements for each exposed metallic part. Any voltage measured must not exceed 0.75 volt RMS which is corresponds to 0.5 mA.
In case any measurement is out of the limits specified, there is possibility of shock hazard and the set must be checked and repaired before it is returned to the customer.

Leakage Current Hot Check circuit



When 25A is impressed between Earth and 2nd Ground for 1 second, Resistance must be less than 0.1 Ω
*Base on Adjustment standard

SERVICING PRECAUTIONS

CAUTION: Before servicing receivers covered by this service manual and its supplements and addenda, read and follow the *SAFETY PRECAUTIONS* on page 3 of this publication.
NOTE: If unforeseen circumstances create conflict between the following servicing precautions and any of the safety precautions on page 3 of this publication, always follow the safety precautions. Remember: Safety First.

General Servicing Precautions

1. Always unplug the receiver AC power cord from the AC power source before;
   a. Removing or reinstalling any component, circuit board module or any other receiver assembly.
   b. Disconnecting or reconnecting any receiver electrical plug or other electrical connection.
   c. Connecting a test substitute in parallel with an electrolytic capacitor in the receiver.
   CAUTION: A wrong part substitution or incorrect polarity installation of electrolytic capacitors may result in an explosion hazard.
2. Test high voltage only by measuring it with an appropriate high voltage meter or other voltage measuring device (DVM, FETVOM, etc) equipped with a suitable high voltage probe.
   Do not test high voltage by "drawing an arc".
3. Do not spray chemicals on or near this receiver or any of its assemblies.
4. Unless specified otherwise in this service manual, clean electrical contacts only by applying the following mixture to the contacts with a pipe cleaner, cotton-tipped stick or comparable non-abrasive applicator; 10 % (by volume) Acetone and 90 % (by volume) isopropyl alcohol (90 % - 99 % strength)
   CAUTION: This is a flammable mixture.
   Unless specified otherwise in this service manual, lubrication of contacts in not required.
5. Do not defeat any plug/socket B+ voltage interlocks with which receivers covered by this service manual might be equipped.
6. Do not apply AC power to this instrument and/or any of its electrical assemblies unless all solid-state device heat sinks are correctly installed.
7. Always connect the test receiver ground lead to the receiver chassis ground before connecting the test receiver positive lead.
   Always remove the test receiver ground lead last.
8. Use with this receiver only the test fixtures specified in this service manual.
   CAUTION: Do not connect the test fixture ground strap to any heat sink in this receiver.

Electrostatically Sensitive (ES) Devices

Some semiconductor (solid-state) devices can be damaged easily by static electricity. Such components commonly are called Electrostatically Sensitive (ES) Devices. Examples of typical ES devices are integrated circuits and some field-effect transistors and semiconductor “chip” components. The following techniques should be used to help reduce the incidence of component damage caused by static by static electricity.

1. Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on your body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging wrist strap device, which should be removed to prevent potential shock reasons prior to applying power to the unit under test.
2. After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.
3. Use only a grounded-tip soldering iron to solder or unsolder ES devices.
4. Use only an anti-static type solder removal device. Some solder removal devices not classified as “anti-static” can generate electrical charges sufficient to damage ES devices.
5. Do not use freon-propelled chemicals. These can generate electrical charges sufficient to damage ES devices.
6. Do not remove a replacement ES device from its protective package until immediately before you are ready to install it. (Most replacement ES devices are packaged with leads electrically shorted together by conductive foam, aluminum foil or comparable conductive material).
7. Immediately before removing the protective material from the leads of a replacement ES device, touch the protective material to the chassis or circuit assembly into which the device will be installed.
   CAUTION: Be sure no power is applied to the chassis or circuit, and observe all other safety precautions.
8. Minimize bodily motions when handling unpackaged replacement ES devices. (Otherwise harmless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity sufficient to damage an ES device.)

General Soldering Guidelines

1. Use a grounded-tip, low-wattage soldering iron and appropriate tip size and shape that will maintain tip temperature within the range or 500 °F to 600 °F.
2. Use an appropriate gauge of RMA resin-core solder composed of 60 parts tin/40 parts lead.
3. Keep the soldering iron tip clean and well tinned.
4. Thoroughly clean the surfaces to be soldered. Use a mall wire-bristle (0.5 inch, or 1.25 cm) brush with a metal handle.
   Do not use freon-propelled spray-on cleaners.
5. Use the following unsoldering technique
   a. Allow the soldering iron tip to reach normal temperature. (500 °F to 600 °F)
   b. Heat the component lead until the solder melts.
   c. Quickly draw the melted solder with an anti-static, suction-type solder removal device or with solder braid.
   CAUTION: Work quickly to avoid overheating the circuit board printed foil.
6. Use the following soldering technique.
   a. Allow the soldering iron tip to reach a normal temperature (500 °F to 600 °F)
   b. First, hold the soldering iron tip and solder the strand against the component lead until the solder melts.
   c. Quickly move the soldering iron tip to the junction of the component lead and the printed circuit foil, and hold it there only until the solder flows onto and around both the component lead and the foil.
   CAUTION: Work quickly to avoid overheating the circuit board printed foil.
   d. Closely inspect the solder area and remove any excess or splashed solder with a small wire-bristle brush.

IC Remove/Replacement
Some chassis circuit boards have slotted holes (oblong) through which the IC leads are inserted and then bent flat against the circuit foil. When holes are the slotted type, the following technique should be used to remove and replace the IC. When working with boards using the familiar round hole, use the standard technique as outlined in paragraphs 5 and 6 above.

Removal
1. Desolder and straighten each IC lead in one operation by gently prying up on the lead with the soldering iron tip as the solder melts.
2. Draw away the melted solder with an anti-static suction-type solder removal device (or with solder braid) before removing the IC.

Replacement
1. Carefully insert the replacement IC in the circuit board.
2. Carefully bend each IC lead against the circuit foil pad and solder it.
3. Clean the soldered areas with a small wire-bristle brush. (It is not necessary to reapply acrylic coating to the areas).

"Small-Signal" Discrete Transistor Removal/Replacement
1. Remove the defective transistor by clipping its leads as close as possible to the component body.
2. Bend into a "U" shape the end of each of three leads remaining on the circuit board.
3. Bend into a "U" shape the replacement transistor leads.
4. Connect the replacement transistor leads to the corresponding leads extending from the circuit board and crimp the "U" with long nose pliers to insure metal to metal contact then solder each connection.

Power Output, Transistor Device
Removal/Replacement
1. Heat and remove all solder from around the transistor leads.
2. Remove the heat sink mounting screw (if so equipped).
3. Carefully remove the transistor from the heat sink of the circuit board.
4. Insert new transistor in the circuit board.
5. Solder each transistor lead, and clip off excess lead.
6. Replace heat sink.

Diode Removal/Replacement
1. Remove defective diode by clipping its leads as close as possible to diode body.
2. Bend the two remaining leads perpendicular y to the circuit board.
3. Observing diode polarity, wrap each lead of the new diode around the corresponding lead on the circuit board.
4. Securely crimp each connection and solder it.
5. Inspect (on the circuit board copper side) the solder joints of the two "original" leads. If they are not shiny, reheat them and if necessary, apply additional solder.

Fuse and Conventional Resistor
Removal/Replacement
1. Clip each fuse or resistor lead at top of the circuit board hollow stake.
2. Securely crimp the leads of replacement component around notch at stake top.
3. Solder the connections.
   CAUTION: Maintain original spacing between the replaced component and adjacent components and the circuit board to prevent excessive component temperatures.

Circuit Board Foil Repair
Excessive heat applied to the copper foil of any printed circuit board will weaken the adhesive that bonds the foil to the circuit board causing the foil to separate from or "lift-off" the board. The following guidelines and procedures should be followed whenever this condition is encountered.

At IC Connections
To repair a defective copper pattern at IC connections use the following procedure to install a jumper wire on the copper pattern side of the circuit board. (Use this technique only on IC connections).

1. Carefully remove the damaged copper pattern with a sharp knife. (Remove only as much copper as absolutely necessary).
2. carefully scratch away the solder resist and acrylic coating (if used) from the end of the remaining copper pattern.
3. Bend a small "U" in one end of a small gauge jumper wire and carefully crimp it around the IC pin. Solder the IC connection.
4. Route the jumper wire along the path of the out-away copper pattern and let it overlap the previously scraped end of the good copper pattern. Solder the overlapped area and clip off any excess jumper wire.

At Other Connections
Use the following technique to repair the defective copper pattern at connections other than IC Pins. This technique involves the installation of a jumper wire on the component side of the circuit board.

1. Remove the defective copper pattern with a sharp knife. Remove at least 1/4 inch of copper, to ensure that a hazardous condition will not exist if the jumper wire opens.
2. Trace along the copper pattern from both sides of the pattern break and locate the nearest component that is directly connected to the affected copper pattern.
3. Connect insulated 20-gauge jumper wire from the lead of the nearest component on one side of the pattern break to the lead of the nearest component on the other side.
   Carefully crimp and solder the connections.
   CAUTION: Be sure the insulated jumper wire is dressed so the it does not touch components or sharp edges.

SPECIFICATION

NOTE : Specifications and others are subject to change without notice for improvement.

1. Application range

This specification is applied to the LED TV used LD33B chassis.

2. Requirement for Test

Each part is tested as below without special appointment.

1) Temperature: 25 °C ± 5 °C(77 °F ± 9 °F), CST: 40 °C ± 5 °C
2) Relative Humidity: 65 % ± 10 %
3) Power Voltage
   : Standard input voltage (AC 100-240 V~, 50/60 Hz)
   * Standard Voltage of each products is marked by models.
4) Specification and performance of each parts are followed each drawing and specification by part number in accordance with BOM.
5) The receiver must be operated for about 20 minutes prior to the adjustment.

3. Test method

1) Performance: LGE TV test method followed
2) Demanded other specification
   - Safety : CE, IEC specification
   - EMC : CE, IEC

4. Model General Specification

No.	Item	Specification	Remarks
1	Market	EU(PAL Market-37Countries)	**DTV & Analog (Total 37 countries)** **DTV (MPEG2/4, DVB-T) : 29 countries** Germany, Netherland, Switzerland, Hungary, Austria, Slovenia, Bulgaria, France, Spain, Italy, Belgium, Luxemburg, Greece, Czech, Croatia, Turkey, Moroco, Ireland, Latvia, Estonia, Lithuania, Poland, Portugal, Romania, Albania, Bosnia, Serbia, Slovakia, Beralus **DTV (MPEG2/4, DVB-T2): 8 countries** UK(Ireland), Sweden, Denmark, Finland, Norway, Ukraine, Kazakhstan, Russia **DTV (MPEG2/4, DVB-C): 37 countries** Germany, Netherland, Switzerland, Hungary, Austria, Slovenia, Bulgaria, France, Spain, Italy, Belgium, Russia, Luxemburg, Greece, Czech, Croatia, Turkey, Moroco, Ireland, Latvia, Estonia, Lithuania, Poland, Portugal, Romania, Albania, Bosnia, Serbia, Slovakia, Beralus, UK, Sweden, Denmark, Finland, Norway, Ukraine, Kazakhstan **DTV (MPEG2/4,DVB-S): 30 countries** Germany, Netherland, Switzerland, Hungary, Austria, Slovenia, Bulgaria, France, Spain, Italy, Belgium, Russia, Luxemburg, Greece, Czech, Croatia, Turkey, Moroco, Ireland, Latvia, Estonia, Lithuania, Poland, Portugal, Romania, Albania, Bosnia, Serbia, Slovakia, Beralus **Supported satellite : 22 satellites** HISPASAT 1C/1D, ATLANTIC BIRD 2, NILESAT 101/102, ATLANTIC BIRD 3, AMOS 2/3, THOR 5/6, IRIUS 4, EUTELSAT-W3A, EUROBIRD 9A, EUTELSAT-W2A, HOTBIRD 6/8/9, EUTELSAT-SESAT, ASTRA 1L/H/M/KR, ASTRA 3A/3B, BADR 4/6, ASTRA 2D, EUROBIRD 3, EUTELSAT-W7, HELLASSAT 2, EXPRESS AM1, TURKSAT 2A/3A, INTERSAT10

No.	Item	Specification	Remarks
2	Broadcasting system	1) PAL-BG 2) PAL-DK 3) PAL-I/I' 4) SECAM-L/L', DK , BG, I 5) DVB-T 6) DVB-C 7) DVB-T2 8) DVB-S/S2	Model : *L*V*-Z* (T2 only Model) DVB-S: Satellite
3	Program coverage	1) Digital TV - VHF, UHF - C-Band,Ku-Band 2) Analogue TV - VHF : E2 to E12 - UHF : E21 to E69 - CATV : S1 to S20 - HYPER : S21 to S47	
4	Receiving system	Analog : Upper Heterodyne Digital : COFDM, QAM	► DVB-T - Guard Interval(Bitrate_Mbit/s) 1/4, 1/8, 1/16, 1/32 - Modulation : Code Rate QPSK : 1/2, 2/3, 3/4, 5/6, 7/8 16-QAM : 1/2, 2/3, 3/4, 5/6, 7/8 64-QAM : 1/2, 2/3, 3/4, 5/6, 7/8 ► DVB-T2 (Model : *L*V*-Z* (T2 only Model)) - Guard Interval(Bitrate_Mbit/s) 1/4, 1/8, 1/16, 1/32, 1/128, 19/128, 19/256, - Modulation : Code Rate QPSK : 1/2, 2/5, 2/3, 3/4, 5/6 16-QAM : 1/2, 2/5, 2/3, 3/4, 5/6 64-QAM : 1/2, 2/5, 2/3, 3/4, 5/6 256-QAM : 1/2, 2/5, 2/3, 3/4, 5/6 ► DVB-C - Symbolrate : 4.0Msymbols/s to 7.2Msymbols/s - Modulation : 16QAM, 64-QAM, 128-QAM and 256-QAM ► DVB-S/S2 - symbolrate DVB-S2 (8PSK / QPSK) : 2 ~ 45Msymbol/s DVB-S (QPSK) : 2 ~ 45Msymbol/s - viterbi DVB-S mode : 1/2, 2/3, 3/4, 5/6, 7/8 DVB-S2 mode : 1/2, 2/3, 3/4, 3/5, 4/5, 5/6, 8/9, 9/10
5	Scart (1EA)	PAL, SECAM	Scart 1 Jack is Full scart and support ATV/DTV-OUT (not support DTV Auto AV)
6	Video Input RCA(1EA)	PAL, SECAM, NTSC	4 System : PAL, SECAM, NTSC, PAL60 Common port
7	Head phone out	Antenna, AV1, AV2, Component, HDMI1, HDMI2, HDMI3, USB1, USB2, USB3	
8	Component Input (1EA)	Y/Cb/Cr Y/Pb/Pr	Hybrid Type
9	HDMI Input (3EA)	HDMI1-DTV HDMI2-DTV HDMI3-DTV	HDMI1: PC support(HDMI version 1.3) Support HDCP
10	Audio Input (3EA)	DVI Audio Component/AV2 AV1	L/R Input.
11	SDPIF out (1EA)	SPDIF out	
12	USB (1EA)	EMF, DivX HD, For SVC (download)	JPEG, MP3, DivX HD
13	Ethernet Connect(1EA)	Ethernet Connect	

5. Component Video Input (Y, PB, PR)

No.	Resolution	H-freq(kHz)	V-freq(Hz)	Pixel clock
1.	720×480	15.73	60.00	SDTV, DVD 480i
2.	720×480	15.63	59.94	SDTV, DVD 480i
3.	720×480	31.47	59.94	480p
4.	720×480	31.50	60.00	480p
5.	720×576	15.625	50.00	SDTV 576i
6.	720×576	31.25	50.00	SDTV 576p
7.	1280×720	45.00	50.00	HDTV 720p
8.	1280×720	44.96	59.94	HDTV 720p
9.	1280×720	45.00	60.00	HDTV 720p
10.	1920×1080	31.25	50.00	HDTV 1080i
11.	1920×1080	33.75	60.00	HDTV 1080i
12.	1920×1080	33.72	59.94	HDTV 1080i
13.	1920×1080	56.250	50	HDTV 1080p
14.	1920×1080	67.5	60	HDTV 1080p

6. HDMI Input
6.1. DTV mode

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)
1.	640*480	31.469 / 31.5	59.94/60	SDTV 480P
2.	720*480	31.469 / 31.5	59.94 / 60	SDTV 480P
3.	720*576	31.25	50	SDTV 576P
4.	720*576	15.625	50	SDTV 576I
5.	1280*720	37.500	50	HDTV 720P
6.	1280*720	44.96 / 45	59.94 / 60	HDTV 720P
7.	1920*1080	33.72 / 33.75	59.94 / 60	HDTV 1080I
8.	1920*1080	28.125	50.00	HDTV 1080I
9.	1920*1080	26.97 / 27	23.97 / 24	HDTV 1080P
10.	1920*1080		25	HDTV 1080P
11.	1920*1080	33.716 / 33.75	29.976 / 30.00	HDTV 1080P
12.	1920*1080	56.250	50	HDTV 1080P
13.	1920*1080	67.43 / 67.5	59.94 / 60	HDTV 1080P

6.2. PC mode

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)
1	640 x 350 @70Hz	31.468	70.09	EGA
2	720 x 400 @70Hz	31.469	70.08	DOS
3	640 x 480 @60Hz	31.469	59.94	VESA(VGA)
4	800 x 600 @60Hz	37.879	60.31	VESA(SVGA)
5	1024 x 768 @60Hz	48.363	60.00	VESA(XGA)
6	1152 x 864 @60Hz	54.348	60.053	VESA
7	1280 x 1024 @60Hz	63.981	60.020	VESA(SXGA)
8	1360 x 768 @60Hz	47.712	60.015	VESA(WXGA)
9	1920 x 1080 @60Hz	67.5	60.00	WUXGA(Reduced Blanking)
10.	1920*1080		25	HDTV 1080P
11.	1920*1080	33.716 / 33.75	29.976 / 30.00	HDTV 1080P
12.	1920*1080	56.250	50	HDTV 1080P
13.	1920*1080	67.43 / 67.5	59.94 / 60	HDTV 1080P

7. 3D Mode

7.1. HDMI 1.4b (3D supported mode automatically)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	VIC	3D input proposed mode	Proposed
1	640*480	31.469 / 31.5	59.94/ 60	25.125	1	Top-and-Bottom Side-by-side(half)	Secondary(SDTV 480P) Secondary(SDTV 480P)
2		62.938/63	59.94/ 60	50.35/50.4	1	Frame packing Line alternative	Secondary(SDTV 480P) (SDTV 480P)
3		31.469 / 31.5	59.94/ 60	50.35/50.4	1	Side-by-side(Full)	(SDTV 480P)
4	720*480	31.469 / 31.5	59.94 / 60	27.00/27.03	2,3	Top-and-Bottom Side-by-side(half)	Secondary(SDTV 480P) Secondary(SDTV 480P)
5		62.938/63	59.94 / 60	54/54.06	2,3	Frame packing Line alternative	Secondary(SDTV 480P) (SDTV 480P)
6		31.469 / 31.5	59.94 / 60	54/54.06	2,3	Side-by-side(Full)	(SDTV 480P)
7	720*576	31.25	50	27	17,18	Top-and-Bottom Side-by-side(half)	Secondary(SDTV 576P) Secondary(SDTV 576P)
8		62.5	50	54	17,18	Frame packing Line alternative	Secondary(SDTV 576P) (SDTV 576P)
9		31.25	50	54	17,18	Side-by-side(Full)	(SDTV 576P)
10	720*576	15.625	50	27	21	Top-and-Bottom Side-by-side(half)	Secondary(SDTV 576I) Secondary(SDTV 576I)
11		31.25	50	54	21	Frame packing Field alternative	Secondary(SDTV 576I) (SDTV 576I)
12		15.625	50	54	21	Side-by-side(Full)	(SDTV 576I)
13	1280*720	37.500	50	74.25	19	Top-and-Bottom Side-by-side(half)	Primary(HDTV 720P) Primary(HDTV 720P)
14		75	50	148.5	19	Frame packing Line alternative	Primary(HDTV 720P) (HDTV 720P)
15		37.500	50	148.5	19	Side-by-side(Full)	(HDTV 720P)
16		44.96 / 45	59.94 / 60	74.18/74.25	4	Top-and-Bottom Side-by-side(half)	Primary(HDTV 720P) Primary(HDTV 720P)
17		89.91/90	59.94 / 60	148.35/148.5	4	Frame packing Line alternative	Primary(HDTV 720P) (HDTV 720P)
18		44.96 / 45	59.94 / 60	148.35/148.5	4	Side-by-side(Full)	(HDTV 720P)
19	1920*1080	33.72 / 33.75	59.94 / 60	74.18/74.25	5	Top-and-Bottom Side-by-side(half)	Secondary(HDTV 1080I) Primary(HDTV 1080I)
20		67.432 / 67.50	59.94 / 60	148.35/148.5	5	Frame packing Field alternative	Primary(HDTV 1080I) (HDTV 1080I)
21		33.72 / 33.75	59.94 / 60	148.35/148.5	5	Side-by-side(Full)	(HDTV 1080I)
22		28.125	50.00	74.25	20	Top-and-Bottom Side-by-side(half)	Secondary(HDTV 1080I) Primary(HDTV 1080I)
23		56.25	50.00	148.5	20	Frame packing Field alternative	Primary(HDTV 1080I) (HDTV 1080I)
24		28.125	50.00	148.5	20	Side-by-side(Full)	(HDTV 1080I)
25	1920*1080	26.97 / 27	23.97 / 24	74.18/74.25	32	Top-and-Bottom Side-by-side(half)	Primary(HDTV 1080P) Primary(HDTV 1080P)
26		43.94/54	23.97 / 24	148.35/148.5	32	Frame packing Line alternative	Primary(HDTV 1080P) (HDTV 1080P)
27		26.97 / 27	23.97 / 24	148.35/148.5	32	Side-by-side(Full)	(HDTV 1080P)
28		28.125	25	74.25	33	Top-and-Bottom Side-by-side(half)	Secondary(HDTV 1080P) Secondary(HDTV 1080P)
29		56.24	25	148.5	33	Frame packing Line alternative	Secondary(HDTV 1080P) (HDTV 1080P)
30		28.12	25	148.5	33	Side-by-side(Full)	(HDTV 1080P)
31		33.716 / 33.75	29.976 / 30.00	74.18/74.25	34	Top-and-Bottom Side-by-side(half)	Primary(HDTV 1080P) Secondary(HDTV 1080P)
32		67.432 / 67.5	29.976 / 30.00	148.35/148.5	34	Frame packing Line alternative	Primary(HDTV 1080P) (HDTV 1080P)
33		33.716 / 33.75	29.976 / 30.00	148.35/148.5	34	Side-by-side(Full)	(HDTV 1080P)
34		56.250	50	148.5	31	Top-and-Bottom Side-by-side(half)	Primary(HDTV 1080P) Secondary(HDTV 1080P)
35		67.43 / 67.5	59.94 / 60	148.35/148.50	16	Top-and-Bottom Side-by-side(half)	Primary(HDTV 1080P) Secondary(HDTV 1080P)

7.2. HDMI Input(1.3)

No.	Resolution	H-freq(kHz)	V-freq.(kHz)	Pixel clock(MHz)	Proposed	3D input proposed mode
1	1280*720	45.00	60.00	74.25	HDTV 720P	2D to 3D, Side by Side(half), Top & Bottom, Single Frame Sequential
2	1280*720	37.500	50	74.25	HDTV 720P	
3	1920*1080	33.75	60.00	74.25	HDTV 1080I	2D to 3D, Side by Side(half), Top & Bottom
4	1920*1080	28.125	50.00	74.25	HDTV 1080I	
5	1920*1080	27.00	24.00	74.25	HDTV 1080P	2D to 3D, Side by Side(Half), Top & Bottom, Checker Board
6	1920*1080	28.12	25	74.25	HDTV 1080P	
7	1920*1080	33.75	30.00	74.25	HDTV 1080P	
8	1920*1080	67.50	60.00	148.5	HDTV 1080P	2D to 3D, Side by Side(half), Top & Bottom, Checkerboard, Single Frame Sequential, Row Interleaving, Column Interleaving
9	1920*1080	56.25	50	148.5	HDTV 1080P	

7.3. RF Input(3D supported mode manually)

No.	Resolution	Proposed	3D input proposed mode
1	HD	1080I 720P	2D to 3D Side by Side(Half) Top & Bottom
2	SD	576P 576I	2D to 3D

7.4. RF Input (3D supported mode automatically)

No.	Signal	3D input proposed mode
1	Frame Compatible	Side by Side(Half), Top & Bottom

7.5. USB Input (3D supported mode manually)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	Proposed	3D input proposed mode
1	1920*1080	33.75	30	74.25	HDTV 1080P	2D to 3D, **Side by Side(Half)***, **Top & Bottom*, Checkerboard*,** Row Interleaving, Column Interleaving (Photo : side by Side(half), Top & Bottom)
	Others	-	-	-	640*350 720*400 640*480 800*600 1152*864 1280*1024	2D to 3D

(“*” 3D supported mode manually & automatically)

7.6. HDMI-PC Input (3D supported mode manually)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	3D input proposed mode	Proposed
1	1024*768	48.36	60	65	2D to 3D, Side by Side(half) Top & Bottom	HDTV 768P
2	1360*768	47.71	60	85.5	2D to 3D, Side by Side(half) Top & Bottom	HDTV 768P
3	1920*1080	67.500	60	148.50	2D to 3D, Side by Side(half) Top & Bottom, Checker Board, Single Frame Sequential, Row Interleaving, Column Interleaving	HDTV 1080P
4	Others	-	-	-	2D to 3D	640*350 720*400 640*480 800*600 1152*864

7.7. DLNA Input (3D supported mode manually)

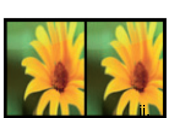
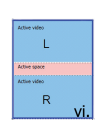
No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	Proposed	3D input proposed mode
1	1920*1080	33.75	30	74.25		2D to 3D, **Side by Side(Half)*,Top & Bottom*,Checker Board***, Row Interleaving, Column Interleaving(Photo : Side by Side(Half), Top&Bottom)

("*" 3D supported mode manually & automatically)

7.8. Component Input(3D) (3D supported mode manually)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock	Proposed	3D input proposed mode
1	1280*720	45.00	60.00	74.25	HDTV 720P	
2	1280*720	37.500	50	74.25	HDTV 720P	
3	1920*1080	33.75	60.00	74.25	HDTV 1080I	
4	1920*1080	28.125	50.00	74.25	HDTV 1080I	
5	1920*1080	27.00	24.00	74.25	HDTV 1080P	2D to 3D, Side by Side(Half), Top & Bottom
6	1920*1080	28.12	25	74.25	HDTV 1080P	
7	1920*1080	33.75	30.00	74.25	HDTV 1080P	
8	1920*1080	67.50	60.00	148.5	HDTV 1080P	
9	1920*1080	56.250	50	148.5	HDTV 1080P	

7.9. 3D Input mode

No.	Side by Side	Top & Bottom	Checker board	Single Frame Sequential	Frame Packing	2D to 3D
1						

ADJUSTMENT INSTRUCTION

1. Application Range

This specification sheet is applied to all of the LED TV with LD33B chassis.

2. Designation

(1) Because this is not a hot chassis, it is not necessary to use an isolation transformer. However, the use of isolation transformer will help protect test instrument.
(2) Adjustment must be done in the correct order.
(3) The adjustment must be performed in the circumstance of 25 °C ± 5 °C of temperature and 65 % ± 10 % of relative humidity if there is no specific designation.
(4) The input voltage of the receiver must keep AC 100-240 V~, 50/60 Hz.
(5) The receiver must be operated for about 5 minutes prior to the adjustment when module is in the circumstance of over 15.

In case of keeping module is in the circumstance of 0 °C, it should be placed in the circumstance of above 15 °C for 2 hours.

In case of keeping module is in the circumstance of below -20 °C, it should be placed in the circumstance of above 15 °C for 3 hours.

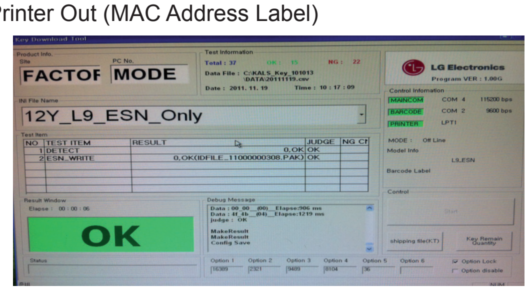
[Caution]
When still image is displayed for a period of 20 minutes or longer (Especially where W/B scale is strong. Digital pattern 13ch and/or Cross hatch pattern 09ch), there can some afterimage in the black level area.

3. Automatic Adjustment

3.1. MAC address D/L, CI+ key D/L, Widevine key D/L, ESN D/L, HDCP14/20 D/L

Connect: USB port
Communication Prot connection

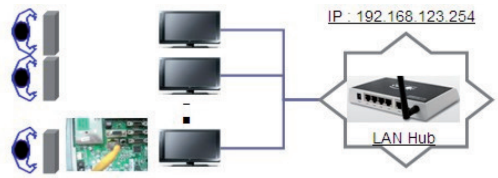
- Com 1,2,3,4 and 115200(Baudrate)
  Mode check: Online Only
- Check the test process: DETECT -> MAC -> CI -> Widevine -> ESN -> HDCP14 -> HDCP20
- Play: Press Enter key
- Result: Ready, Test, OK or NG
- Printer Out (MAC Address Label)



3.2. LAN Inspection

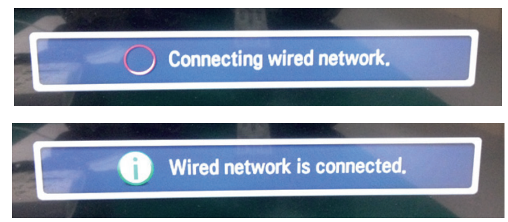
3.2.1. Equipment & Condition

- Each other connection to LAN Port of IP Hub and Jig

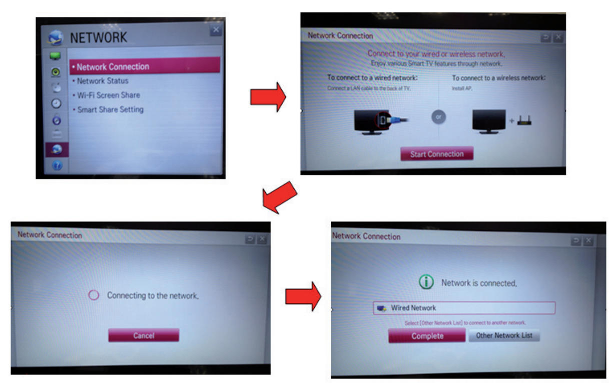


3.2.2. LAN inspection solution

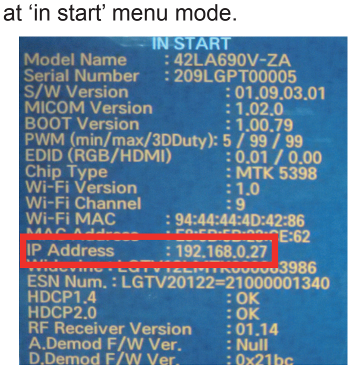
- LAN Port connection with PCB
- Setting automatic IP



- If you want manual connection, enter Network connection at MENU Mode of TV. Press Start connection key, then Network will be connected.

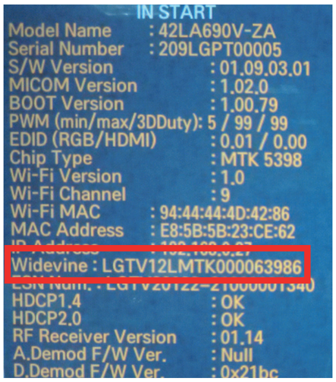


- Setting state confirmation
  - If automatic setting is finished, you confirm IP and MAC Address at 'in start' menu mode.



3.2.3. WIDEVINE key Inspection

- Confirm key input data at the "IN START" MENU Mode.



3.3. LAN PORT INSPECTION(PING TEST)

Connect SET → LAN port == PC → LAN Port

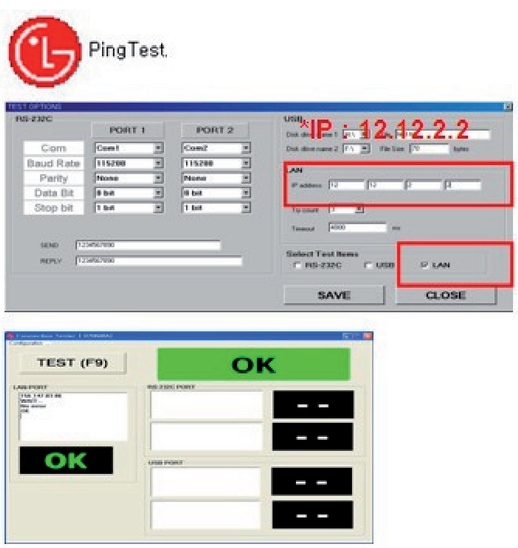


3.3.1. Equipment setting

(1) Play the LAN Port Test PROGRAM.
(2) Input IP set up for an inspection to Test Program.
*IP Number : 12.12.2.2

3.3.2. LAN PORT inspection(PING TEST)

(1) Play the LAN Port Test Program.
(2) Connect each other LAN Port Jack.
(3) Play Test (F9) button and confirm OK Message.
(4) Remove LAN cable.



3.4. Model name & Serial number Download

3.4.1. Model name & Serial number D/L

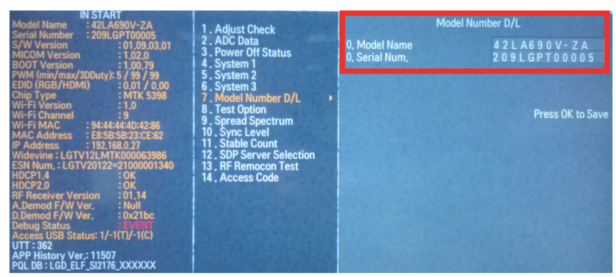
- Press "P-ONLY" key of service remote control.
  (Baud rate : 115200 bps)
- Connect RS-232C Signal to USB Cable to USB.
- Write Serial number by use USB port.
- Must check the serial number at Instart menu.

3.4.2. Method & notice

(1) Serial number D/L is using of scan equipment.
(2) Setting of scan equipment operated by Manufacturing Technology Group.
(3) Serial number D/L must be conformed when it is produced in production line, because serial number D/L is mandatory by D-book 4.0.

*** Manual Download (Model Name and Serial Number)**

If the TV set is downloaded by OTA or service man, sometimes model name or serial number is initialized.(Not always)
It is impossible to download by bar code scan, so It need Manual download.
1) Press the "Instart" key of Adjustment remote control.
2) Go to the menu "7.Model Number D/L" like below photo.
3) Input the Factory model name(ex 42LA690V-ZA) or Serial number like photo.

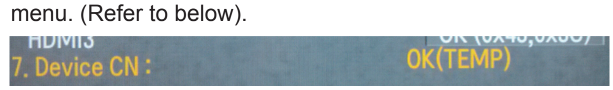


4) Check the model name Instart menu. → Factory name displayed. (ex 42LA690V-ZA)
5) Check the Diagnostics.(DTV country only) → Buyer model displayed. (ex 42LA690V-ZA)

3.5. CI+ Key checking method

- Check the Section 3.1

Check whether the key was downloaded or not at 'In Start' menu. (Refer to below).



=> Check the Download to CI+ Key value in LGset.

3.5.1. Check the method of CI+ Key value

(1) Check the method on Instart menu

(2) Check the method of RS232C Command

1) Into the main ass'y mode(RS232: aa 00 00)

CMD 1	CMD 2	Data 0	
A	A	0	0

2) Check the key download for transmitted command (RS232: ci 00 10)

CMD 1	CMD 2	Data 0	
C	I	1	0

3) Result value
- Normally status for download : OKx
- Abnormally status for download : NGx

3.5.2. Check the method of CI+ key value(RS232)

1) Into the main ass'y mode(RS232: aa 00 00)

CMD 1	CMD 2	Data 0	
A	A	0	0

2) Check the mothed of CI+ key by command (RS232: ci 00 20)

CMD 1	CMD 2	Data 0	
C	I	2	0

3) Result value

i 01 OK 1d1852d21c1ed5dcx

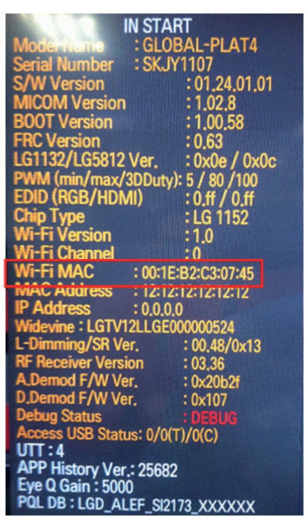
→ CI+ Key Value

3.6. WIFI MAC ADDRESS CHECK

(1) Using RS232 Command

	H-freq(kHz)	V-freq.(Hz)
Transmission	[A][I][][Set ID][][20][Cr]	[O][K][X] or [NG]

(2) Check the menu on in-start



4. Manual Adjustment

* ADC adjustment is not needed because of OTP(Auto ADC adjustment)

4.1. EDID DATA

4.1.1. 3D EDID

HDMI_EDID DATA _3D

	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07	0x08	0x09	0x0A	0x0B	0x0C	0x0D	0x0E	0x0F
0x00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	ⓐ		ⓑ			
0x01	ⓒ		01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
0x02	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	81	80
0x03	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
0x04	45	00	40	84	63	00	00	1E	66	21	50	B0	51	00	1B	30
0x05	40	70	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
0x06	3E	1E	53	10	00	0A	20	20	20	20	20	20	ⓓ			
0x07	ⓓ														01	ⓔ1
0x00	02	03	3A	F1	4E	10	9F	04	13	05	14	03	02	12	20	21
0x01	22	15	01	29	3D	06	C0	15	07	50	09	57	07	ⓕ		
0x02	ⓕ															
0x03	ⓕ						ⓖ				02	3A	80	18	71	38
0x04	2D	40	58	2C	45	00	40	84	63	00	00	1E	01	1D	80	18
0x05	71	1C	16	20	58	2C	25	00	40	84	63	00	00	9E	01	1D
0x06	00	72	51	D0	1E	20	6E	28	55	00	40	84	63	00	00	1E
0x07	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	ⓔ2

▪ Reference
- HDMI1 ~ HDMI4 / RGB
- In the data of EDID, bellows may be different by S/W or Input mode.

ⓐ Product ID

HEX	EDID Table	DDC Function
0001	0100	Analog
0001	0100	Digital

ⓑ Serial No: Controlled on production line.

ⓒ Month, Year: Controlled on production line:

ex) Monthly : '01' → '01'

Year : '2013' → '17'

ⓓ Model Name(Hex): LGTV

Chassis	MODEL NAME(HEX)
LD33B	00 00 00 FC 00 4C 47 20 54 56 0A 20 20 20 20 20 20 20

ⓔ Checksum(LG TV): Changeable by total EDID data.

	ⓔ1	ⓔ2	ⓔ2	ⓔ3
		10bit /none XvYcc	8bit /none XvYcc	
HDMI1	E8	85	CC	X
HDMI2	E8	75	BC	X
HDMI3	E8	65	AC	X

ⓕ Vendor Specific(HDMI)

1) Deep color (module 10bit)

INPUT	MODEL NAME(HEX)
HDMI1	78 03 0C 00 10 00 B8 2D 20 C0 0E 01 4F 3F FC 08 10 18 10 06 10 16 10 28 10
HDMI2	78 03 0C 00 20 00 B8 2D 20 C0 0E 01 4F 3F FC 08 10 18 10 06 10 16 10 28 10
HDMI3	78 03 0C 00 30 00 B8 2D 20 C0 0E 01 4F 3F FC 08 10 18 10 06 10 16 10 28 10

2) None deep color (module 8bit)

INPUT	MODEL NAME(HEX)
HDMI1	78 03 0C 00 10 00 80 1E 20 C0 0E 01 4F 3F FC 08 10 18 10 06 10 16 10 28 10
HDMI2	78 03 0C 00 20 00 80 1E 20 C0 0E 01 4F 3F FC 08 10 18 10 06 10 16 10 28 10
HDMI3	78 03 0C 00 30 00 80 1E 20 C0 0E 01 4F 3F FC 08 10 18 10 06 10 16 10 28 10

ⓖ Colorimetry Data Block(HDMI)

1) The Model not supporting XvYcc

INPUT	MODEL NAME(HEX)
HDMI1	E3 05 00 00
HDMI2	E3 05 00 00
HDMI3	E3 05 00 00

4.1.2. 2D EDID

HDMI_EDID DATA _2D

	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07	0x08	0x09	0x0A	0x0B	0x0C	0x0D	0x0E	0x0F
0x00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	ⓐ		ⓑ			
0x01	ⓒ		01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
0x02	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	81	80
0x03	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
0x04	45	00	A0	5A	00	00	00	1E	66	21	50	B0	51	00	1B	30
0x05	40	70	36	00	A0	5A	00	00	00	1E	00	00	00	FD	00	3A
0x06	3E	1E	53	10	00	0A	20	20	20	20	20	20	ⓓ			
0x07	ⓓ														01	ⓔ1
0x00	02	03	26	F1	4E	10	9F	04	13	05	14	03	02	12	20	21
0x01	22	15	01	26	15	07	50	09	57	07	ⓕ					
0x02	ⓕ		E3	05	00	00	01	1D	80	18	71	1C	16	20	58	2C
0x03	25	00	A0	5A	00	00	00	9E	01	1D	00	80	51	D0	1A	20
0x04	6E	88	55	00	A0	5A	00	00	00	1A	02	3A	80	18	71	38
0x05	2D	40	58	2C	45	00	A0	5A	00	00	00	1E	66	21	50	B0
0x06	51	00	1B	30	40	70	36	00	A0	5A	00	00	00	1E	00	00
0x07	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	ⓔ2

- Reference
  - HDMI1 ~ HDMI4 / RGB
  - In the data of EDID, bellows may be different by S/W or Input mode.

ⓐ Product ID

HEX	EDID Table	DDC Function
0001	0100	Analog
0001	0100	Digital

ⓑ Serial No: Controlled on production line.

ⓒ Month, Year: Controlled on production line:
ex) Monthly : ‘01’ → ‘01’
Year : ‘2012’ → ‘16’

ⓓ Model Name(Hex): LGTV

Chassis	MODEL NAME(HEX)
LD33B	00 00 00 FC 00 4C 47 20 54 56 0A 20 20 20 20 20 20 20

ⓔ Checksum(LG TV): Changeable by total EDID data.

	ⓔ1	ⓔ2	ⓔ3
HDMI1	43	15	X
HDMI2	43	05	X
HDMI3	43	F5	X

ⓕ Vendor Specific(HDMI)

INPUT	MODEL NAME(HEX)
HDMI1	67 03 0C 00 10 00 80 2D
HDMI2	67 03 0C 00 20 00 80 2D
HDMI3	67 03 0C 00 30 00 80 2D

4.2. White Balance Adjustment

4.2.1. Overview

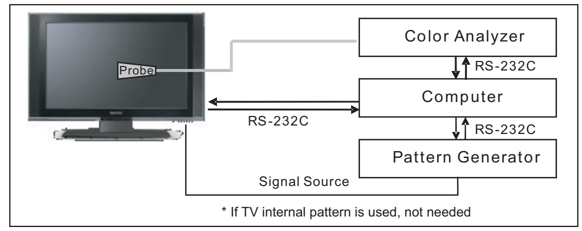
- W/B adj. Objective & How-it-works
  (1) Objective: To reduce each Panel's W/B deviation
  (2) How-it-works : When R/G/B gain in the OSD is at 192, it means the panel is at its Full Dynamic Range. In order to prevent saturation of Full Dynamic range and data, one of R/G/B is fixed at 192, and the other two is lowered to find the desired value.
  (3) Adjustment condition : normal temperature
    1) Surrounding Temperature : 25 °C ± 5 °C
    2) Surrounding Humidity : 20 % ~ 80 %

4.2.2. Equipment

(1) Color Analyzer: CA-210 (LED Module : CH 14)
(2) Adjustment Computer(During auto adj., RS-232C protocol is needed)
(3) Adjustment Remote control
(4) Video Signal Generator MSPG-925F 720p/216-Gray (Model: 217, Pattern: 78)
→ Only when internal pattern is not available

- Color Analyzer Matrix should be calibrated using CS-1000.

4.2.3. Equipment connection MAP



4.2.4. Adj. Command (Protocol)

<Command Format>

START	6E	A	50	A	LEN	A	03	A	CMD	A	00	A	VAL	A	CS	STOP

- LEN: Number of Data Byte to be sent
- CMD: Command
- VAL: FOS Data value
- CS: Checksum of sent data
- A: Acknowledge

Ex) [Send: JA_00_DD] / [Ack: A_00_okDDX]

- RS-232C Command used during auto-adjustment.

RS-232C COMMAND [CMD	ID	DATA]	Explantion
wb	00	00	Begin White Balance adjustment
wb	00	10	Gain adjustment(internal white pattern)
wb	00	1f	Gain adjustment completed
wb	00	20	Offset adjustment(internal white pattern)
wb	00	2f	Offset adjustment completed
wb	00	ff	End White Balance adjustment (internal pattern disappears)

Ex) wb 00 00 -> Begin white balance auto-adj.
wb 00 10 -> Gain adj.
ja 00 ff -> Adj. data
jb 00 c0
...
...
wb 00 1f → Gain adj. completed
*(wb 00 20(Start), wb 00 2f(end)) → Off-set adj.
wb 00 ff → End white balance auto-adj.

- Adj. Map

Applied Model : LD33B Chassis ALL MODELS

	Adj. item	Command (lower caseASCII)		Data Range (Hex.)		Default (Decimal)
		CMD1	CMD2	MIN	MAX	
Cool	R Gain	j	g	00	C0	
	G Gain	j	h	00	C0	
	B Gain	j	i	00	C0	
	R Cut					
	G Cut					
	B Cut					
Medium	R Gain	j	a	00	C0	
	G Gain	j	b	00	C0	
	B Gain	j	c	00	C0	
	R Cut					
	G Cut					
	B Cut					
Warm	R Gain	j	d	00	C0	
	G Gain	j	e	00	C0	
	B Gain	j	f	00	C0	
	R Cut					
	G Cut					

4.2.5. Adj. method

(1) Auto adj. method

1) Set TV in adj. mode using POWER ON key.
2) Zero calibrate probe then place it on the center of the Display.
3) Connect Cable.(RS-232C to USB)
4) Select mode in adj. Program and begin adj.
5) When adj. is complete (OK Sign), check adj. status pre mode. (Warm, Medium, Cool)
6) Remove probe and RS-232C cable to complete adj.

▪ W/B Adj. must begin as start command “wb 00 00” , and finish as end command “wb 00 ff”, and Adj. offset if need.

(2) Manual adjustment. method

1) Set TV in Adj. mode using POWER ON.
2) Zero Calibrate the probe of Color Analyzer, then place it on the center of LCD module within 10 cm of the surface.
3) Press ADJ key → EZ adjust using adj. R/C → 7. White-Balance then press the cursor to the right(key ►).
   (When right key(►) is pressed 204 Gray internal pattern will be displayed)
4) One of R Gain / G Gain / B Gain should be fixed at 192, and the rest will be lowered to meet the desired value.
5) Adjustment is performed in COOL, MEDIUM, WARM 3 modes of color temperature.

▪ If internal pattern is not available, use RF input. In EZ Adj. menu 7.White Balance, you can select one of 2 Test-pattern: ON, OFF. Default is inner(ON). By selecting OFF, you can adjust using RF signal in 204 Gray pattern.

▪ Adjustment condition and cautionary items

1) Lighting condition in surrounding area
   Surrounding lighting should be lower 10 lux. Try to isolate adj. area into dark surrounding.
2) Probe location
   : Color Analyzer(CA-210) probe should be within 10 cm and perpendicular of the module surface (80° ~ 100°)
3) Aging time
   - After Aging Start, Keep the Power ON status during 5 Minutes.
   - In case of LCD, Back-light on should be checked using no signal or Full-white pattern.

4.2.6. Reference (White balance Adj. coordinate and color temperature)

▪ Luminance : 204 Gray

▪ Standard color coordinate and temperature using CS-1000 (over 26 inch)

Mode	Coordinate		Temp	∆uv
	x	y		
Cool	0.269	0.273	13000 K	0.0000
Medium	0.285	0.293	9300 K	0.0000
Warm	0.313	0.329	6500 K	0.0000

▪ Standard color coordinate and temperature using CA-210(CH 14)

Mode	Coordinate		Temp	∆uv
	x	y		
Cool	0.269 ± 0.002	0.273 ± 0.002	13000 K	0.0000
Medium	0.285 ± 0.002	0.293 ± 0.002	9300 K	0.0000
Warm	0.313 ± 0.002	0.329 ± 0.002	6500K	0.0000

4.2.7. ALELF & EDGE LED White balance table

- EDGE LED module change color coordinate because of aging time.
- Apply under the color coordinate table, for compensated aging time.

* Normal Line
[LN5xxx, LA6xxx, LA7xxx, LA8xxx]

NC4.0	Aging time (Min)	Cool		Medium		Warm	
		X	y	x	y	x	y
		271	270	286	289	313	329
1	0-2	283	287	298	306	322	342
2	3-5	282	285	297	304	321	340
3	6-9	281	284	296	303	320	339
4	10-19	279	281	294	300	318	336
5	20-35	277	277	292	296	316	332
6	36-49	275	274	290	293	314	329
7	50-79	273	272	288	291	312	327
8	80-119	272	271	287	290	311	326
9	Over 120	271	270	286	289	310	325

*Aging Chamber
[LN5xxx, LA6xxx, LA7xxx, LA8xxx]

NC4.0	Aging time (Min)	Cool		Medium		Warm	
		X	y	x	y	x	y
		271	270	286	289	313	329
1	0-5	282	285	297	304	321	340
2	6-10	278	280	293	299	317	335
3	11-20	275	275	290	294	314	330
4	21-30	272	272	287	291	311	327
5	31-40	269	269	284	288	308	324
6	41-50	268	267	283	286	307	322
7	51-80	267	266	282	285	306	321
8	81-119	266	264	281	283	305	319
9	Over 120	265	263	280	282	304	318

4.3. Local Dimming Function Check

Step 1) Turn on TV.

Step 2) At the Local Dimming mode, module Edge Backlight moving right to left Back light of IOP module moving.

Step 3) Confirm the Local Dimming mode.

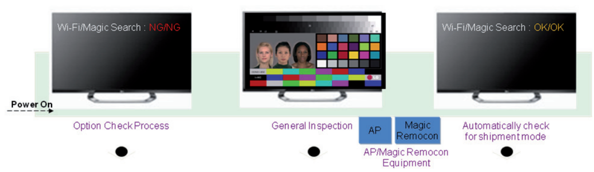
Step 4) Press "exit" key.

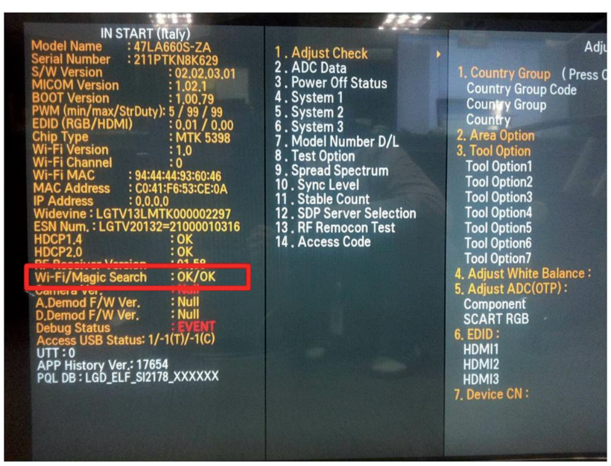


Local Dimming Demo.
(Edge LED Model)

4.4. Magic Motion Remote control test

- Results are automatically marked in Instart OSD after through the AP/Magic Remocon Equipment on the line



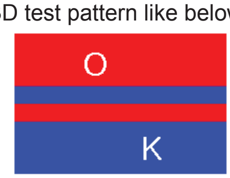


4.5. 3D function test

(Pattern Generator MSHG-600, MSPG-6100[Support HDMI1.4])

* HDMI mode NO. 872 , pattern No.83

(1) Please input 3D test pattern like below.



(2) When 3D OSD appear automatically, then select OK key.



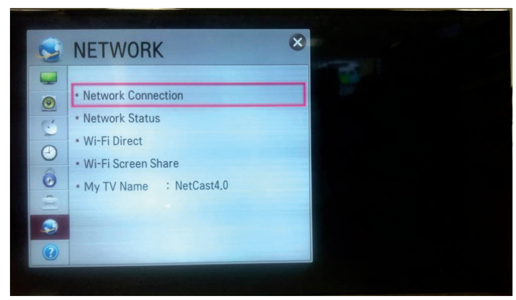
(3) Don't wear a 3D Glasses, check the picture like below.



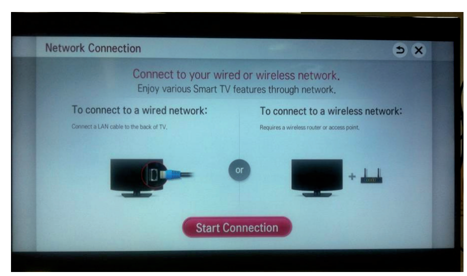
4.6. Wi-Fi Test

Step 1) Turn on TV

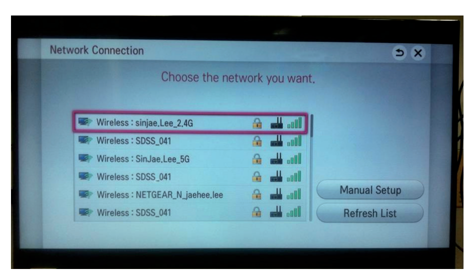
Step 2) Select Network Connection option in Network Menu.



Step 3) Select Start Connection button in Network Connection.



Step 4) If the system finds any AP like blow PIC, it is working well.



4.7. LNB voltage and 22KHz tone check
(only for DVB-S/S2 model)

▪ Test method

(1) Set TV in Adj. mode using POWER ON.
(2) Connect cable between satellite ANT and test JIG.
(3) Press Yellow key(ETC+SWAP) in Adj Remote control to make LNB on.
(4) Check LED light 'ON' at 18 V menu.
(5) Check LED light 'ON' at 22 KHz tone menu.
(6) Press Blue key(ETC+PIP INPUT) in Adj Remote control to make LNB off.
(7) Check LED light 'OFF' at 18 V menu.
(8) Check LED light 'OFF' at 22 KHz tone menu.

▪ Test result

(1) After press LNB On key, '18 V LED' and '22 KHz tone LED' should be ON.
(2) After press LNB OFF key, '18 V LED' and '22 KHz tone LED' should be OFF.

4.8. Option selection per country
4.8.1. Overview
- Option selection is only done for models in Non-EU

4.8.2. Method
(1) Press ADJ key on the Adj. R/C, then select Country Group Meun
(2) Depending on destination, select Country Group Code 04 or Country Group EU then on the lower Country option, select US, CA, MX. Selection is done using +, - or ►◄ key.

5. Tool Option selection
▪ Method : Press "ADJ" key on the Adjustment remote control, then select Tool option.

6. Ship-out mode check(In-stop)
▪ After final inspection, press "IN-STOP" key of the Adjustment remote control and check that the unit goes to Stand-by mode.

7. GND and Internal Pressure check
7.1. Method
(1) GND & Internal Pressure auto-check preparation
- Check that Power cord is fully inserted to the SET. (If loose, re-insert)

(2) Perform GND & Internal Pressure auto-check
- Unit fully inserted Power cord, Antenna cable and A/V arrive to the auto-check process.
- Connect D-terminal to AV JACK TESTER
- Auto CONTROLLER(GWS103-4) ON
- Perform GND TEST
- If NG, Buzzer will sound to inform the operator.
- If OK, changeover to I/P check automatically. (Remove CORD, A/V form AV JACK BOX.)
- Perform I/P test
- If NG, Buzzer will sound to inform the operator.
- If OK, Good lamp will lit up and the stopper will allow the pallet to move on to next process.

7.2. Checkpoint
▪ TEST voltage
- GND: 1.5 KV / min at 100 mA
- SIGNAL: 3 KV / min at 100 mA

▪ TEST time: 1 second

▪ TEST POINT
- GND TEST = POWER CORD GND & SIGNAL CABLE METAL GND
- Internal Pressure TEST = POWER CORD GND & LIVE & NEUTRAL

▪ LEAKAGE CURRENT: At 0.5 mArms

8. Audio
Measurement condition:
(1) RF input: Mono, 1 KHz sine wave signal, 100 % Modulation
(2) CVBS, Component: 1 KHz sine wave signal 0.5 Vrms
(3) RGB PC: 1 KHz sine wave signal 0.7 Vrms

No.	Item	Min	Typ	Max	Unit	Remark
1.	Audio practical max Output, L/R (Distortion=10% max Output)	9	10	12	W	EQ Off AVL Off Clear Voice Off
			8.10	10.8	Vrms	
2.	Speaker (8Ω Impedance)	9	10	12	W	

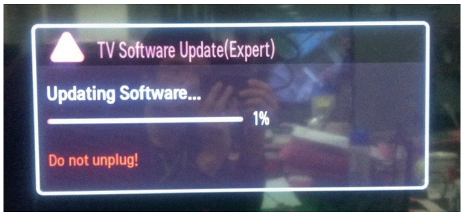
9. USB S/W Download(Service only)

(1) Put the USB Stick to the USB socket

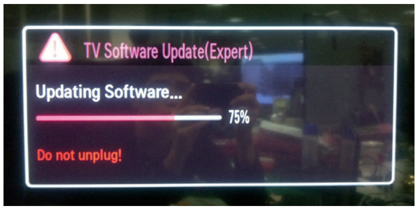
(2) Automatically detecting update file in USB Stick

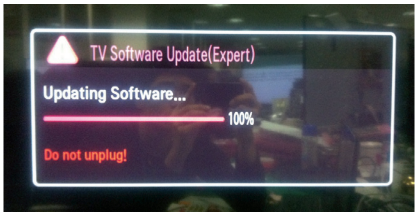
- If your downloaded program version in USB Stick is Lower, it didn't work.
  But your downloaded version is Higher, USB data is automatically detecting (Download Version High & Power only mode, Set is automatically Download)

(3) Show the message "Do not unplug!"



(4) Updating is starting.





(5) Updating Completed, The TV will restart automatically

(6) If your TV is turned on, check your updated version and Tool option. (explain the Tool option, next stage)

* If downloading version is more high than your TV have, TV can lost all channel data. In this case, you have to channel recover. if all channel data is cleared, you didn't have a DTV/ATV test on production line.

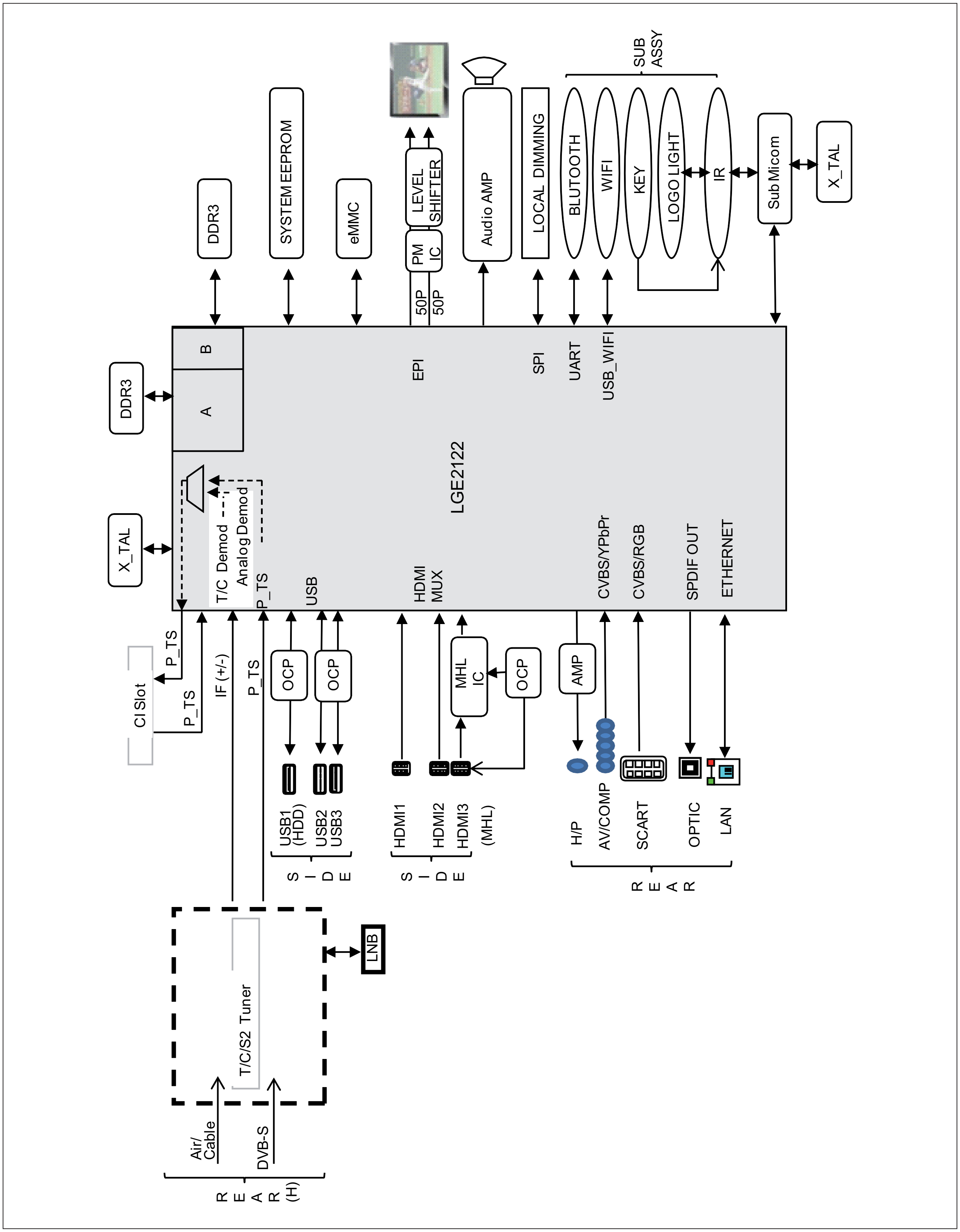
* After downloading, have to adjust Tool Option again.

(1) Push "IN-START" key in service remote control.

(2) Select "Tool Option 1" and push "OK" key.

(3) Punch in the number. (Each model has their number)

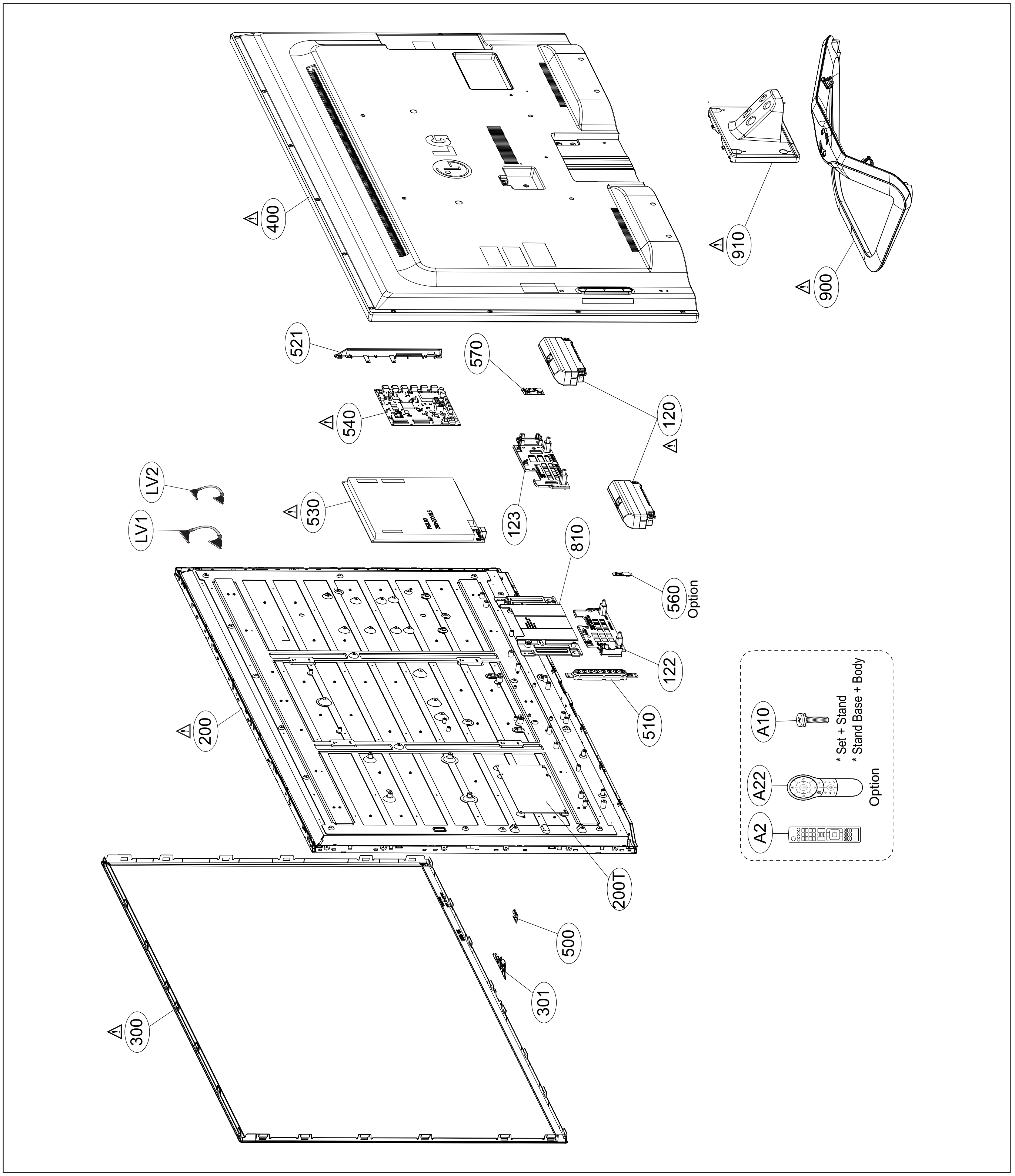
BLOCK DIAGRAM



EXPLODED VIEW

IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by ⚠ in the Schematic Diagram and EXPLODED VIEW.
It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent X-RADIATION, Shock, Fire, or other Hazards.
Do not modify the original design without permission of manufacturer.



LG

Life's Good

2013 LED/LCD TV Engineering guide

< Applicable Model : Mid-end Platform >

XXLA74*-Z*
XXLA71*-Z*
XXLA69/66*-Z*
XXLA64/62/61*-Z*
XXLN57*-Z*

◈ CONTENT ◈

EPI Interface

- EPI(Embedded Point-Point Interface)
- Features
  - **Point-Point topology (support 2 Pair option)**
  - **CDR (Clock Data Recovery)**
  - **Bandwidth up to 1.85Gbps/pair at FHD 120Hz 10 bit application**
  - **Lock signal cascading and feedback to T-Con**
  - **Embedded Control Data**
- Merits
  - **Better reliability on common noise**
  - **No data skew and better EMI margin**
  - **Fewer lines than mini-LVDS**
  - **Slim PCB design**

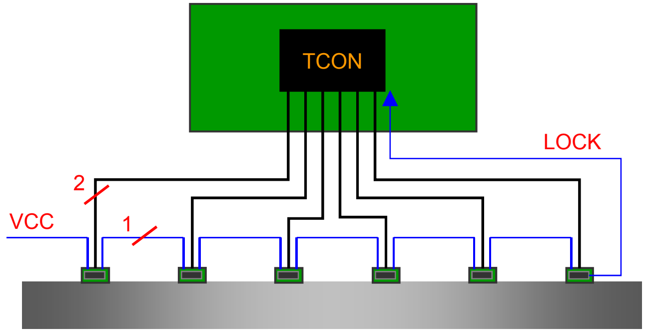


Figure1. Topology

Table 1. Example of FHD 120Hz TV

EPI	FHD (10bit) @ 960Ch		
	60Hz	120Hz	240Hz
Transmission Line	12	12	24
Bandwidth	0.84Gbps	1.68Gbps	1.68Gbps

EPI Interface (mini-LVDS vs. EPI)

Comparison

HF mini-LVDS

HF mini-LVDS	FHD (10bit)		
	60Hz	120Hz	240Hz
No. of Signal	36	36	72
Connector	60pin (2ea)	60pin (2ea)	80pin (2ea)

-Difficult to upgrade bandwidth limit
-Multiple number of wires needed for higher bandwidth

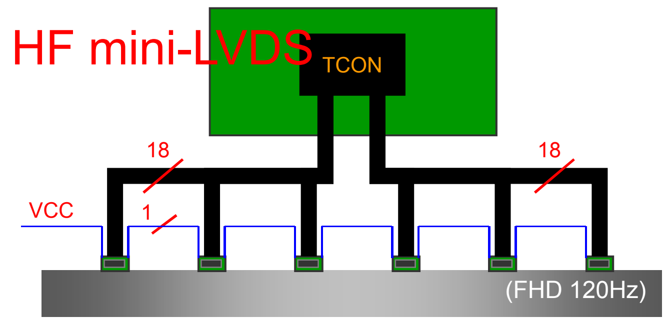
EPI (Embedded clock P-to-P Interface)

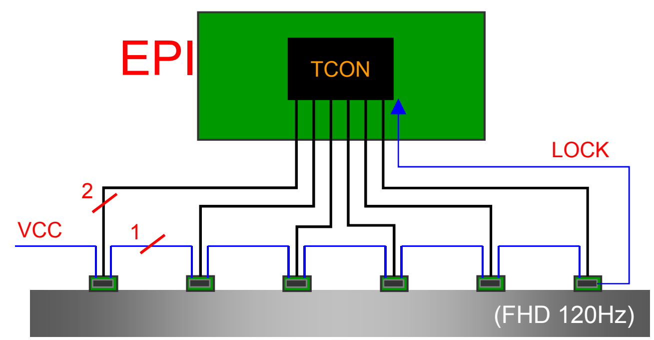
EPI	FHD (10bit)		
	60Hz	120Hz	240Hz
	960ch	960ch	720ch
No. of Signal	12	12	32
Connector	-	50 pin (2ea)	70pin (2ea)

-Better reliability on common noise
-No data skew. Better EMI margin
-Lower cost (Cable, Connector)
-Slim S-PCB design (14mm → 10mm) helps slimmer TV

What to change

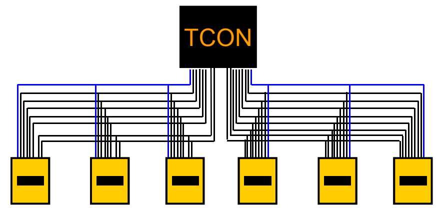
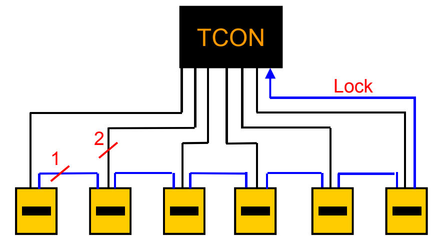
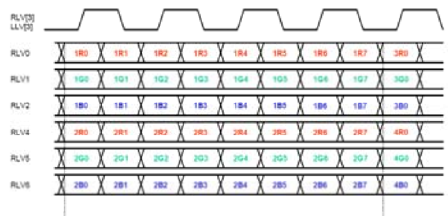
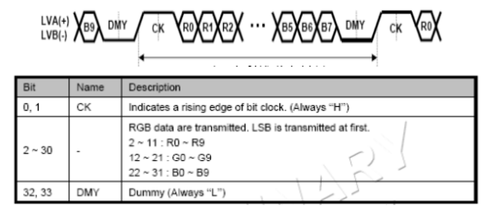
LCM (T-con to S-Driver IC)





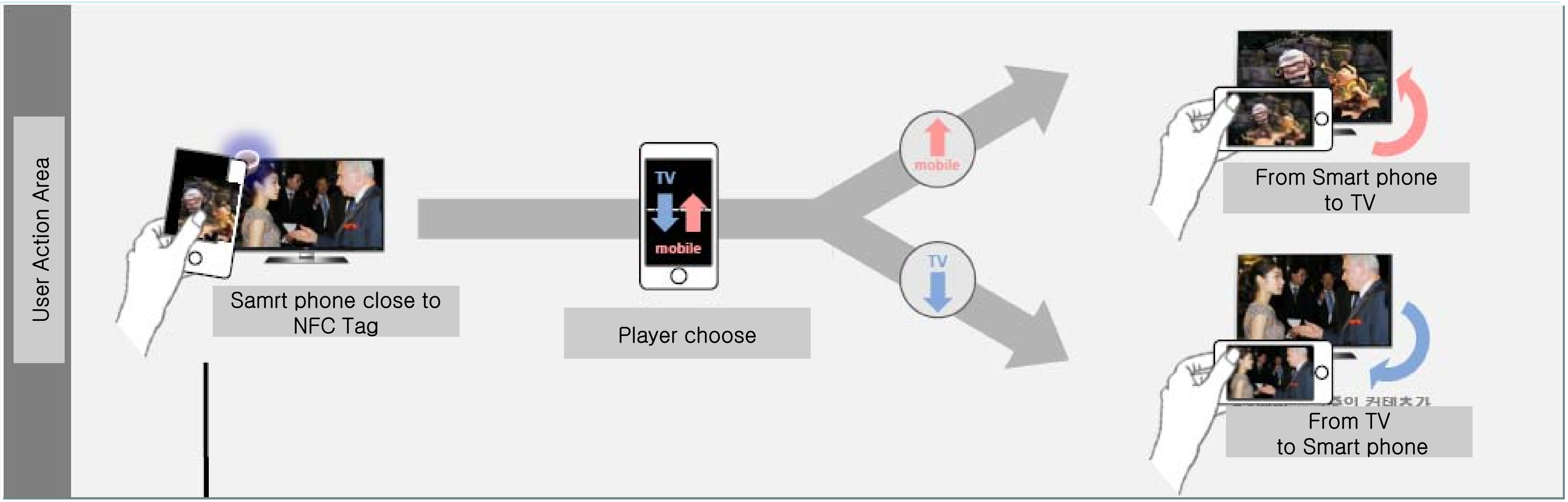
* Bandwidth Capability
- FHD 120Hz 10Bit : 594Mbps@36Lines → 1.65Gbps@12Lines
- FHD 240Hz 10Bit : 594Mbps@72Lines → 1.25Gbps@32Lines

EPI Interface (mini-LVDS vs. EPI)

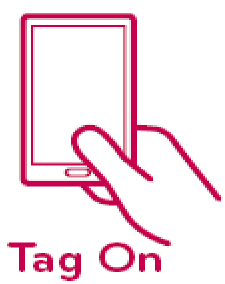
	HF mini-LVDS	EPI
Topology		
Protocol		
Features @10bit, FHD120	• Multi Drop • Data rate: 660Mbps • External clock	• Point to Point • Data rate : 1.8Gbps • Embedded clock, Control
Merit	• Simple structure • Standardization	• Fewer Lines : 12 • Embedded clock : low EMI, Clock skew free • Easy to PCB design
Demerit	• Too many lines : 36 • Clock skew • EMI due to clock lines • Bandwidth limit	• Transmission Overhead : 4bit delimiter

NFC (Near field communication)

Near field communication (NFC) is a set of standards for smartphones and similar devices to establish radio communication with each other by touching them together or bringing them into close proximity, usually no more than a few centimetres. Present and anticipated applications include contactless transactions, data exchange, and simplified setup of more complex communications such as Wi-Fi. Communication is also possible between an NFC device and an unpowered NFC chip, called a "tag".



Tag On



Touch the smartphone to the Tag On sticker.

- Using an LG smartphone with the NFC and Miracast functions, you can:
  - TV to Phone: run the LG TV Remote app on the smartphone.
  - Phone to TV: view the screen of the smartphone on the TV.

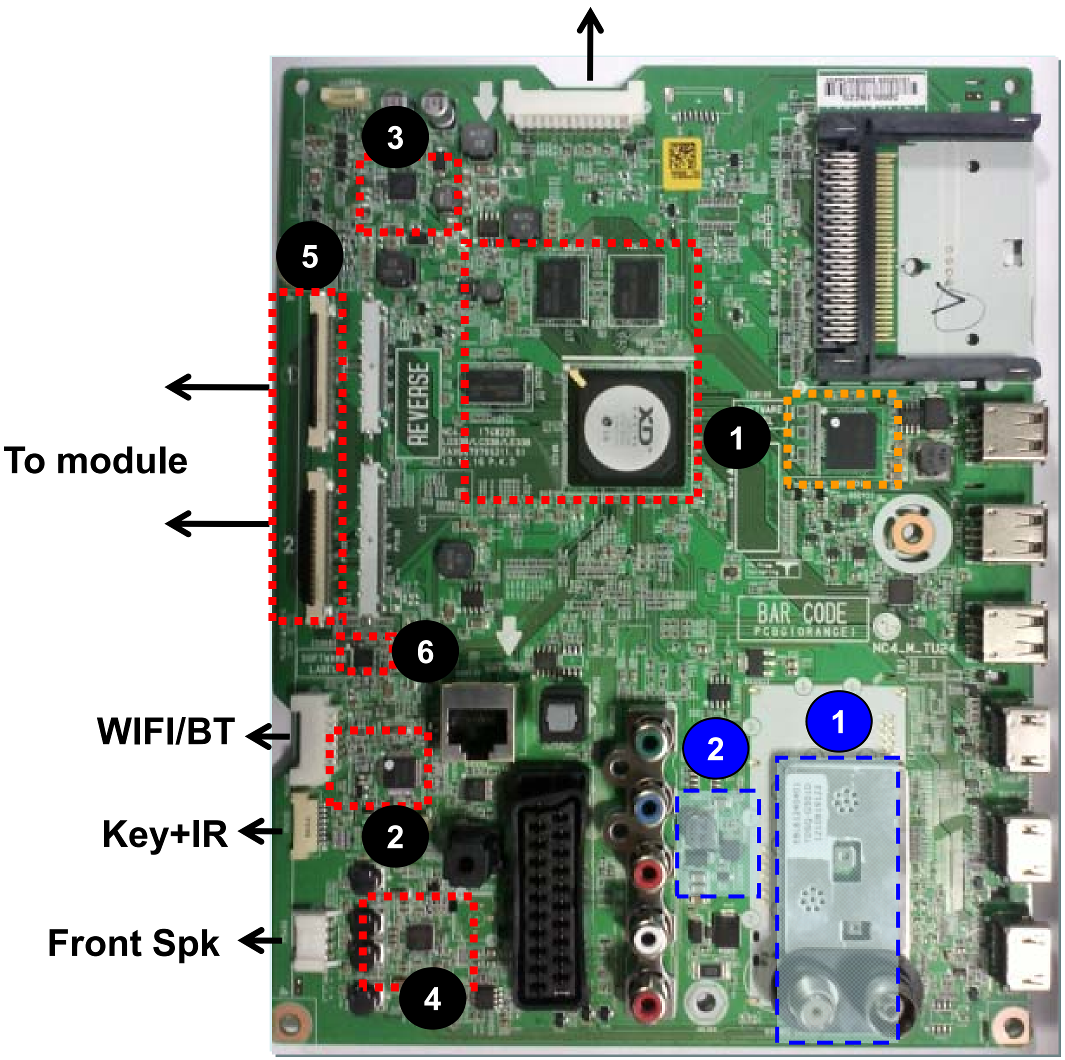
  To end the connection, touch the smartphone to the Tag On sticker again.
  (You can also disable the Miracast function on the smartphone.)

Main PCB for Broadband

Main + TCON all in one

xxLA660S-Zx

Chassis : LD33B
PCB P/No : EAX64797003



1



S model

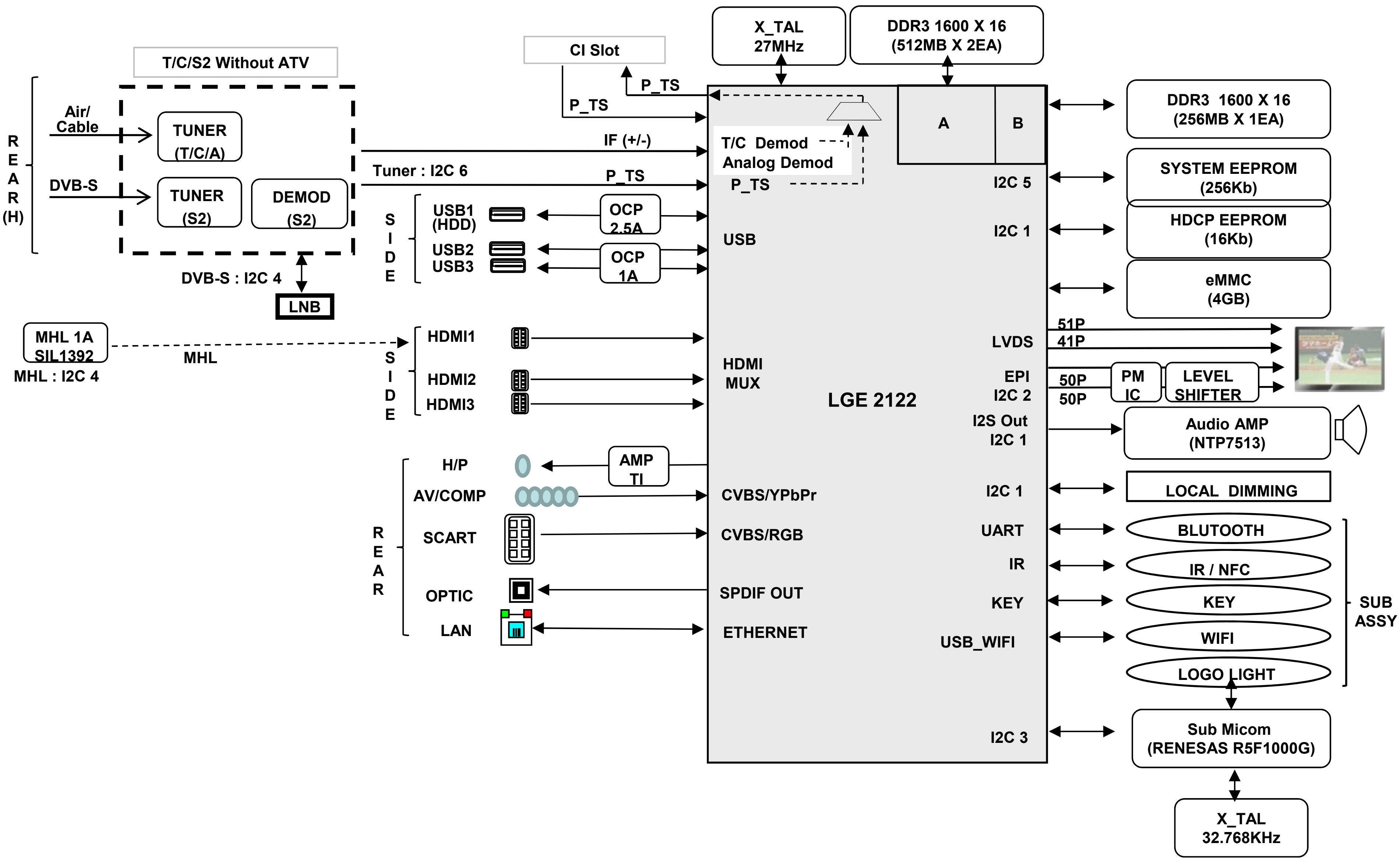
2



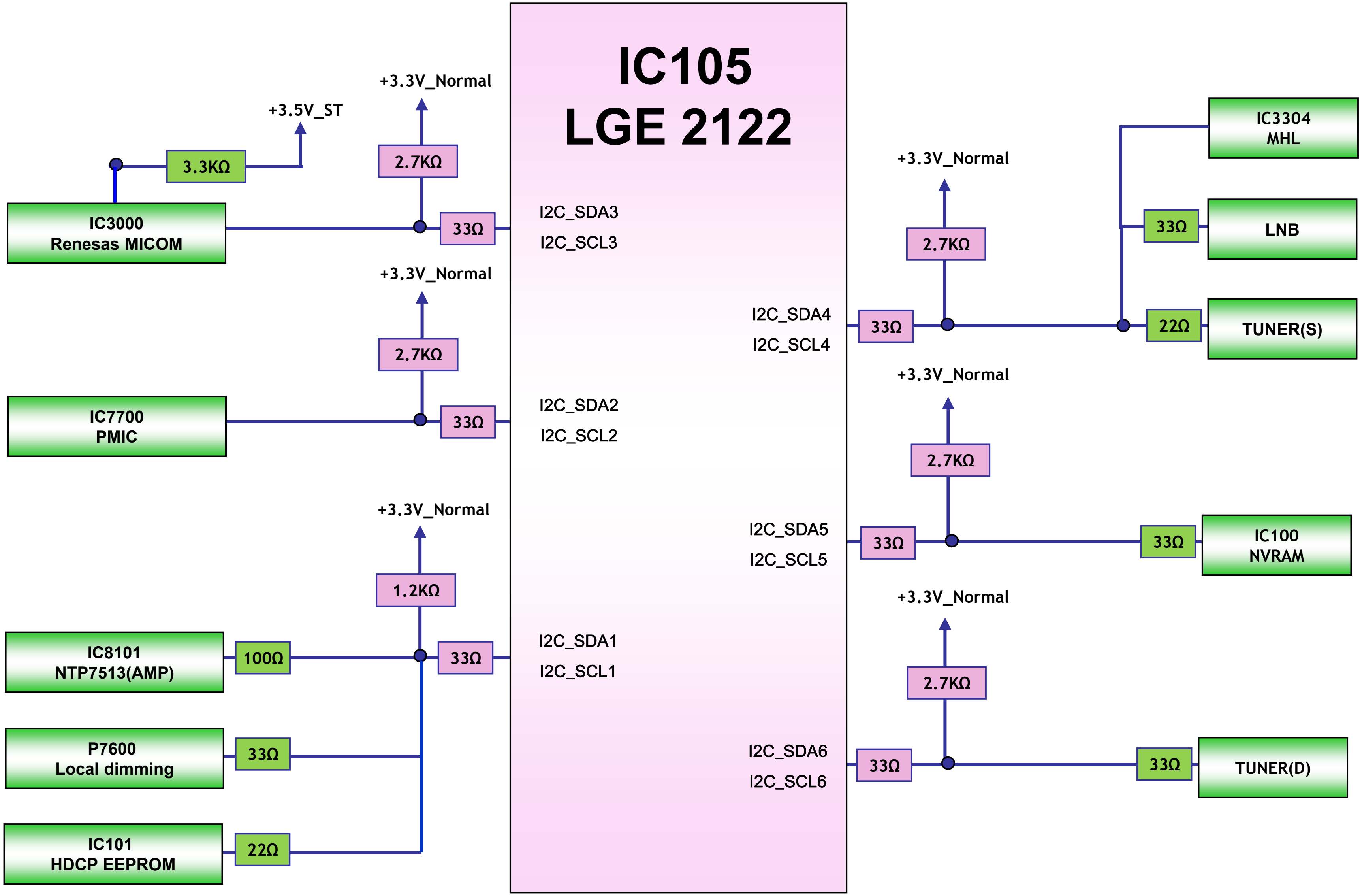
LNB IC Block
Only S model

1	Main processor, DDR Memory eMMC Memory
2	Micom for Key/IR sensing
3	PMIC
4	Audio AMP
5	EPI Wafer
6	Level shifter

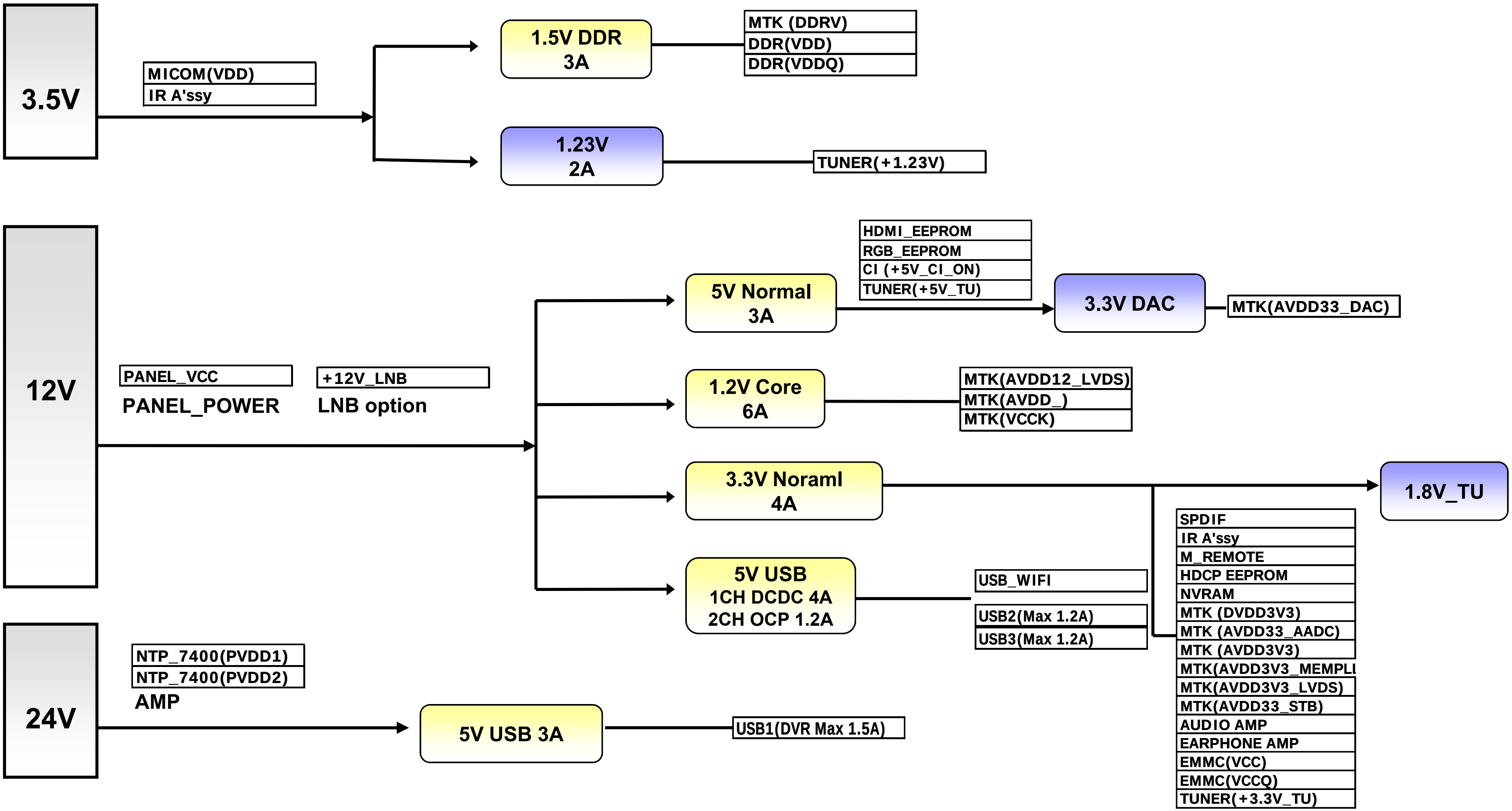
1. LGE2122 Block Diagram



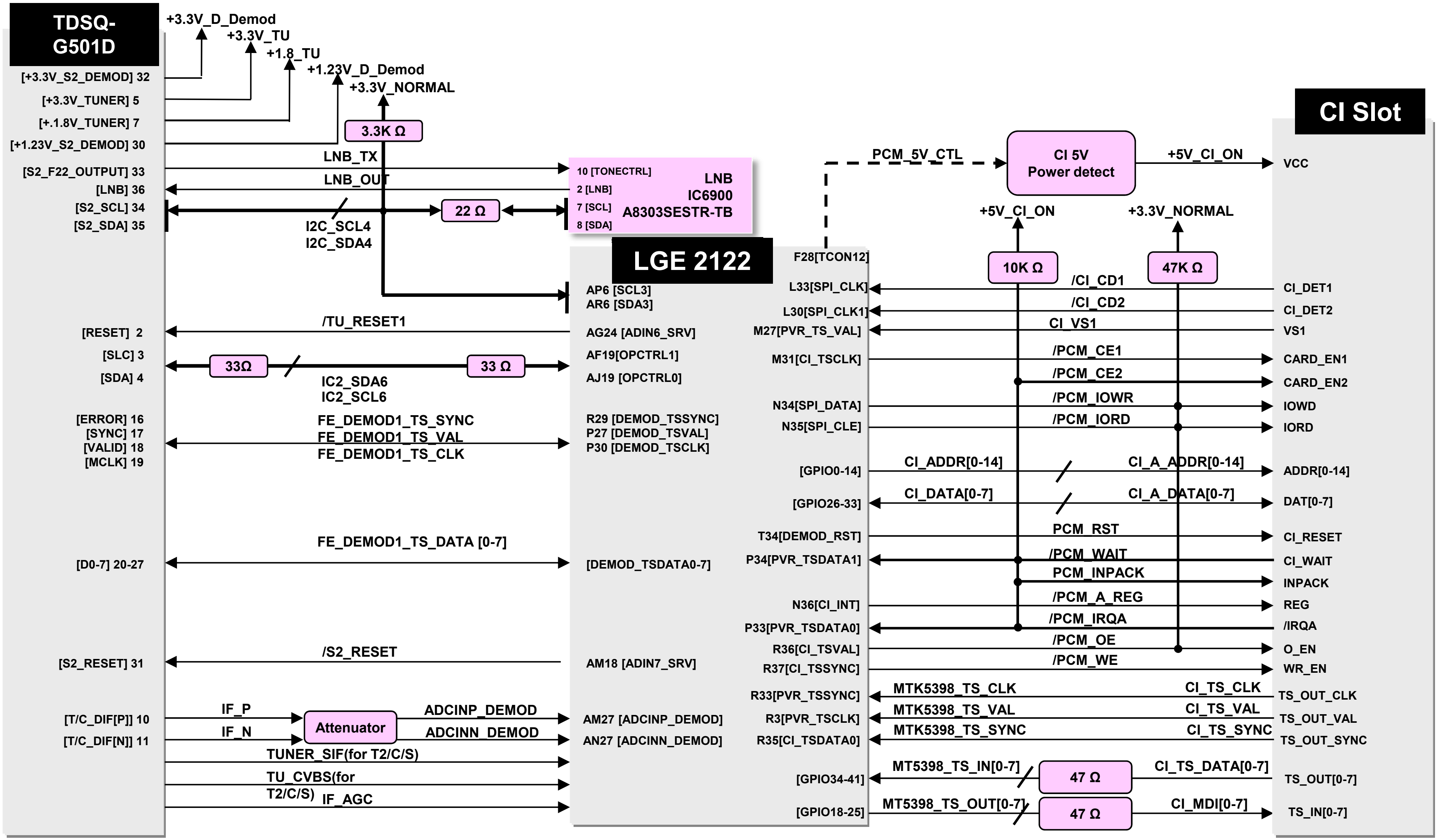
2. LGE 2122 I2C Block Diagram



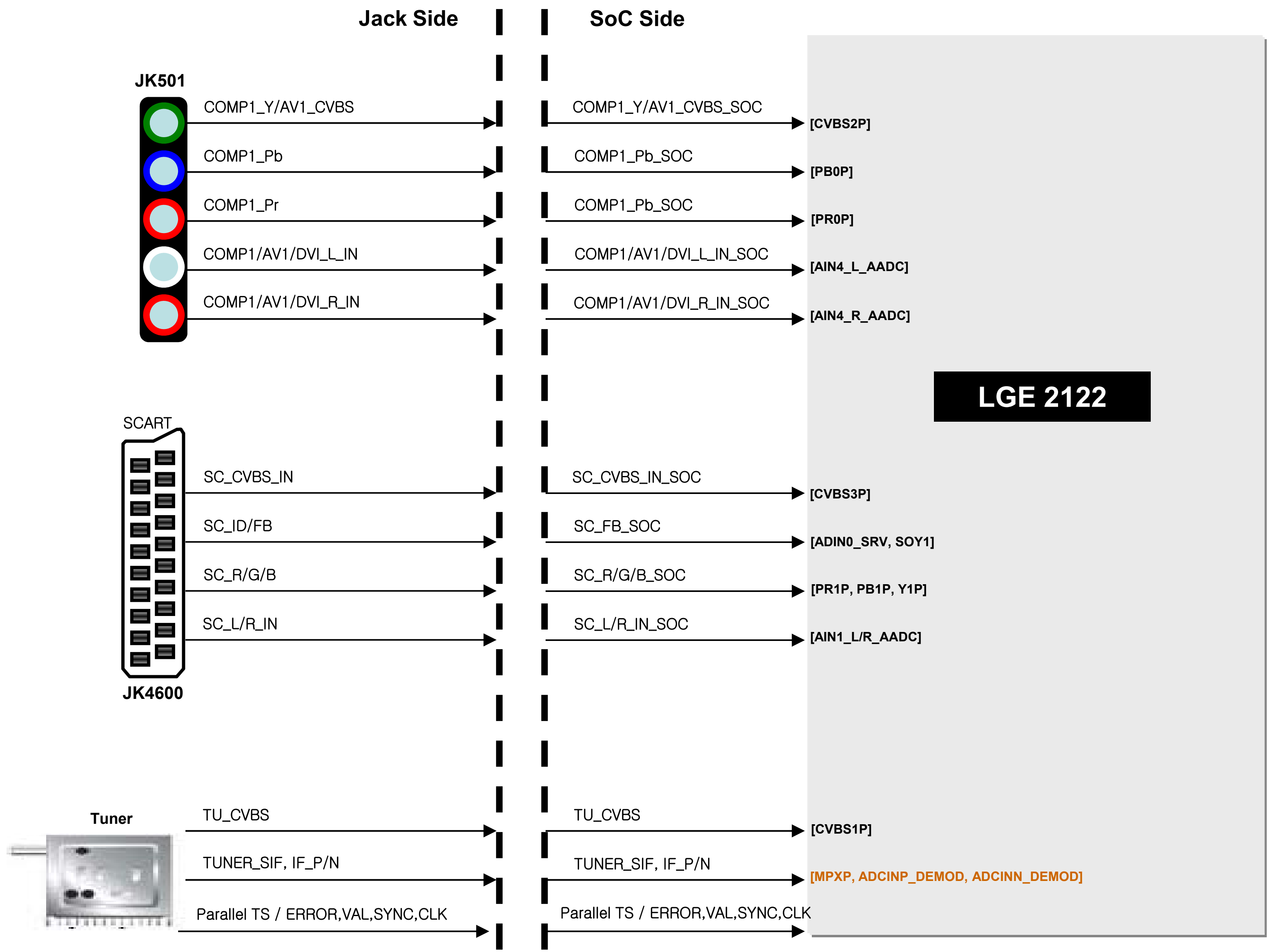
3. Power Block Diagram



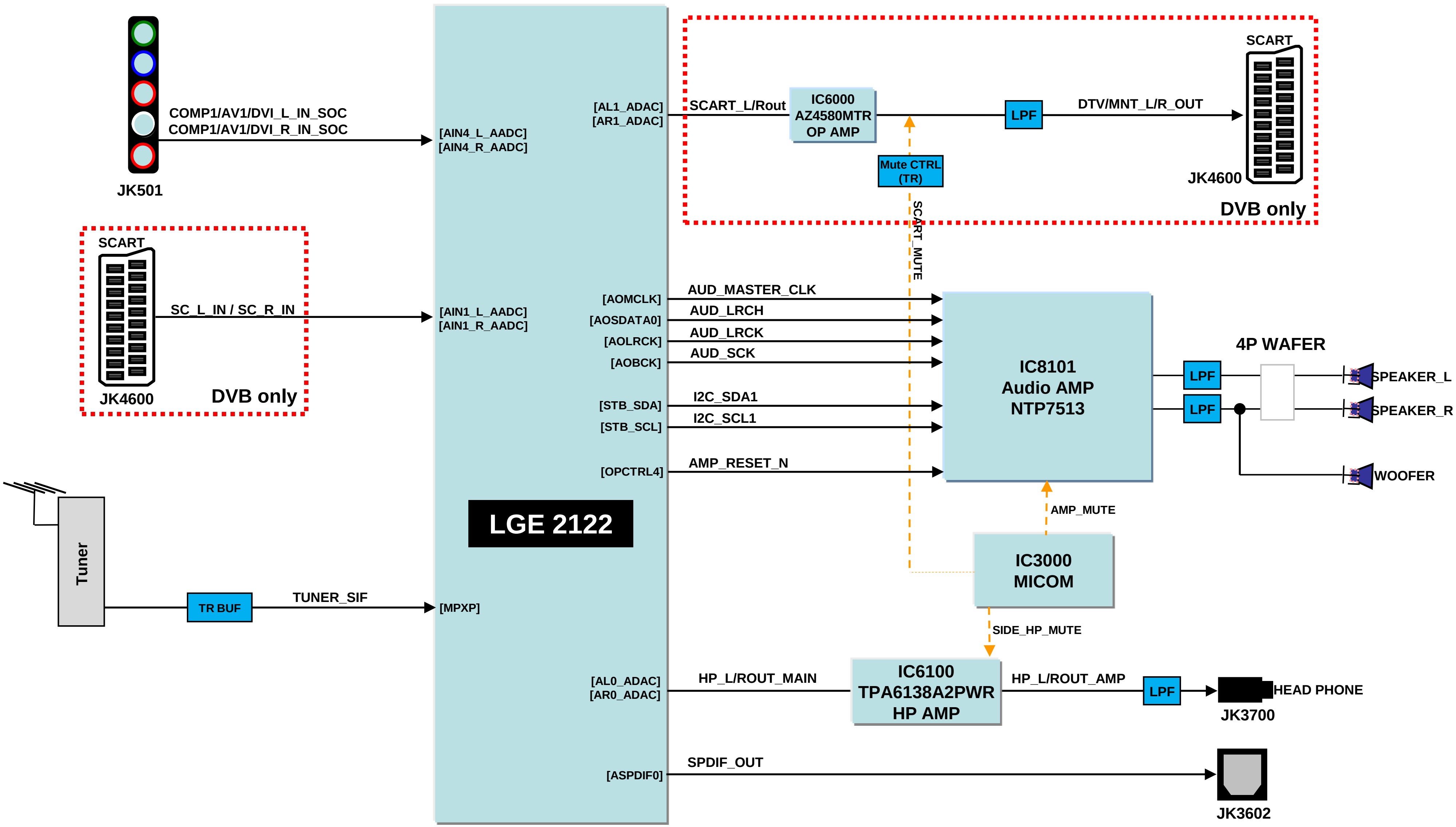
4. Tuner/CI Block Diagram



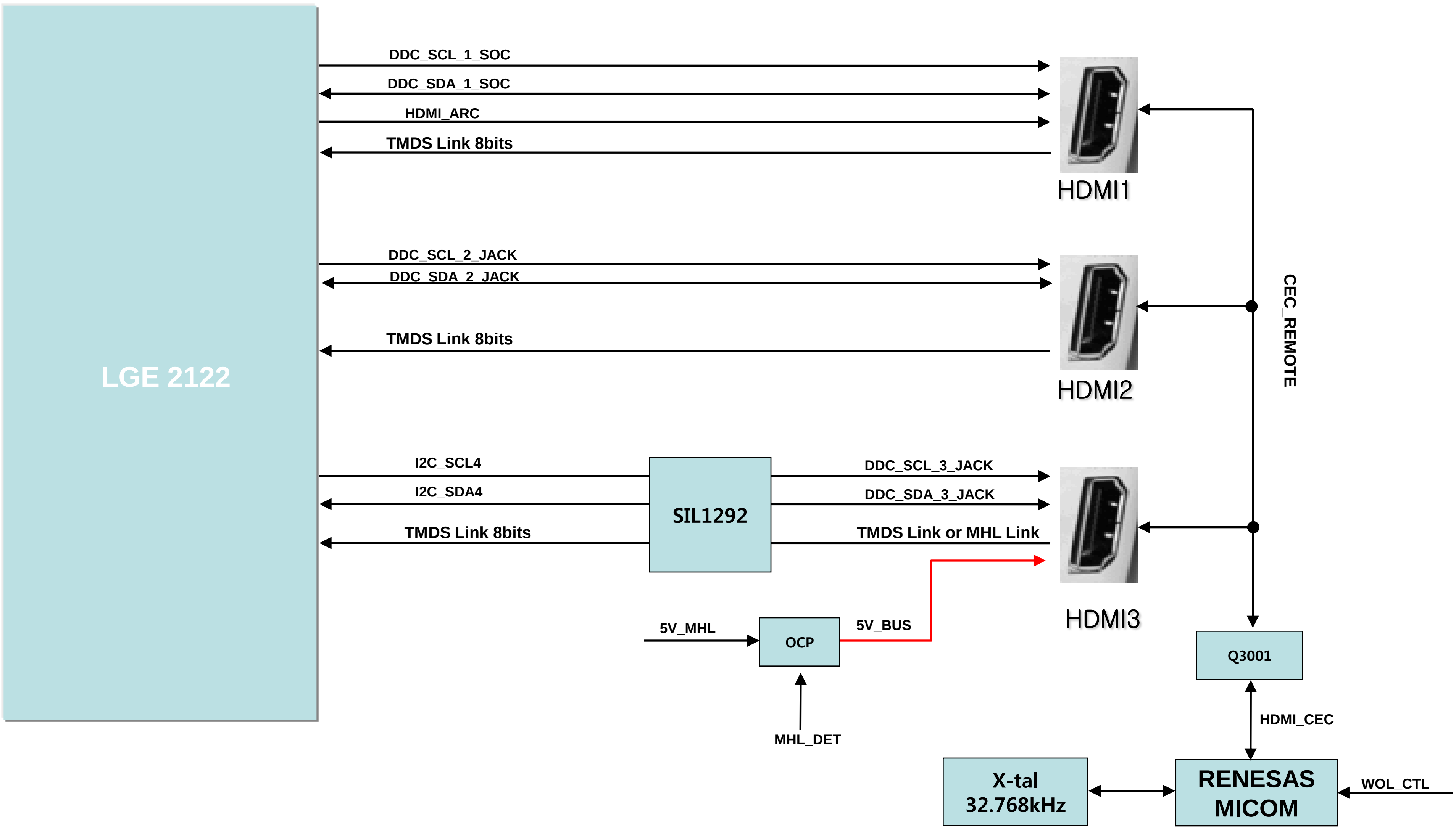
5. Video/Audio In Block Diagram



6. Audio Out Block Diagram

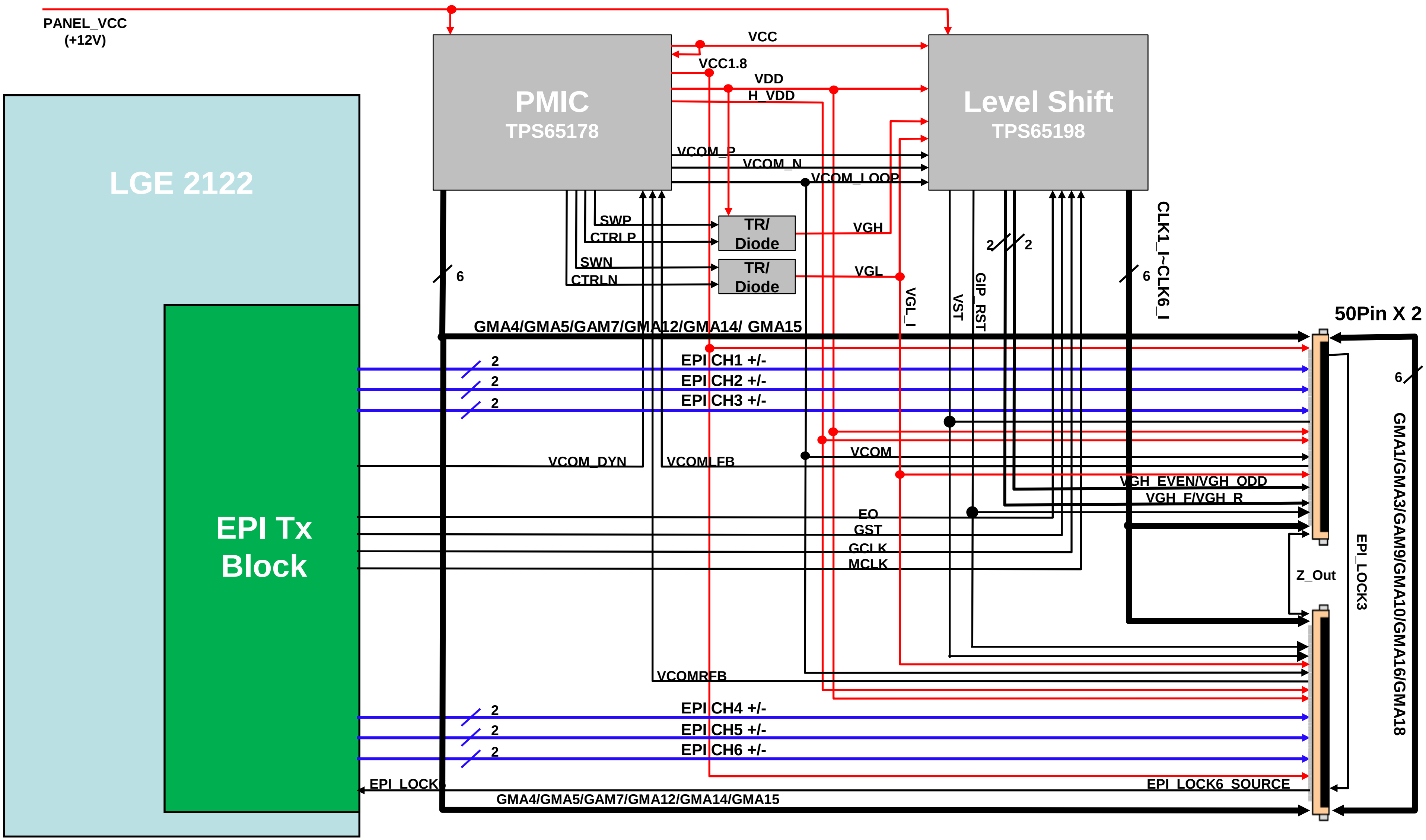


7. HDMI

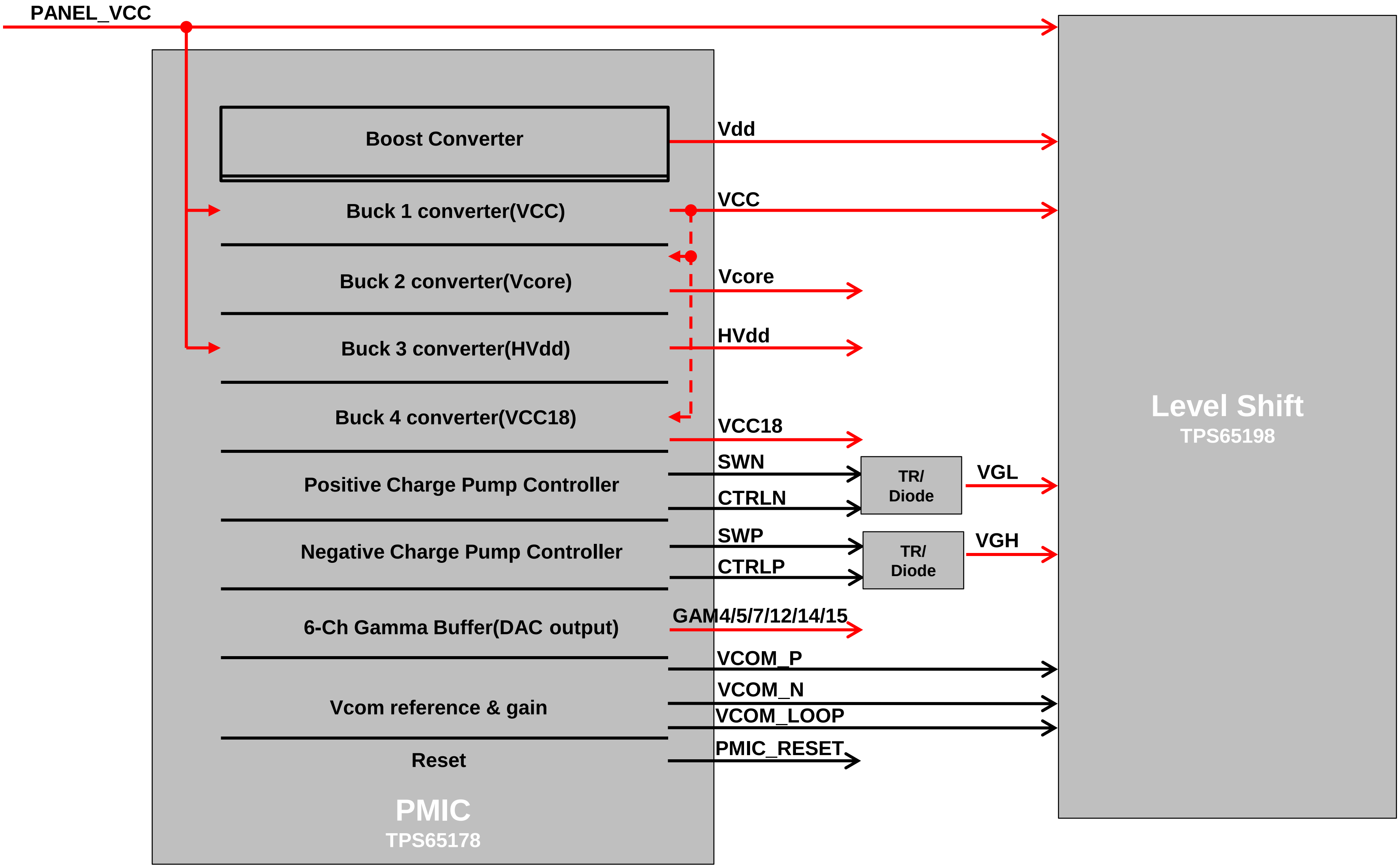


LGE 2122
DDC_SCL_1_SOC
DDC_SDA_1_SOC
HDMI_ARC
TMDS Link 8bits
HDMI1
DDC_SCL_2_JACK
DDC_SDA_2_JACK
TMDS Link 8bits
HDMI2
CEC_REMOTE
I2C_SCL4
I2C_SDA4
TMDS Link 8bits
SIL1292
DDC_SCL_3_JACK
DDC_SDA_3_JACK
TMDS Link or MHL Link
HDMI3
5V_MHL
OCP
5V_BUS
MHL_DET
Q3001
HDMI_CEC
X-tal
32.768kHz
RENESAS
MICOM
WOL_CTL

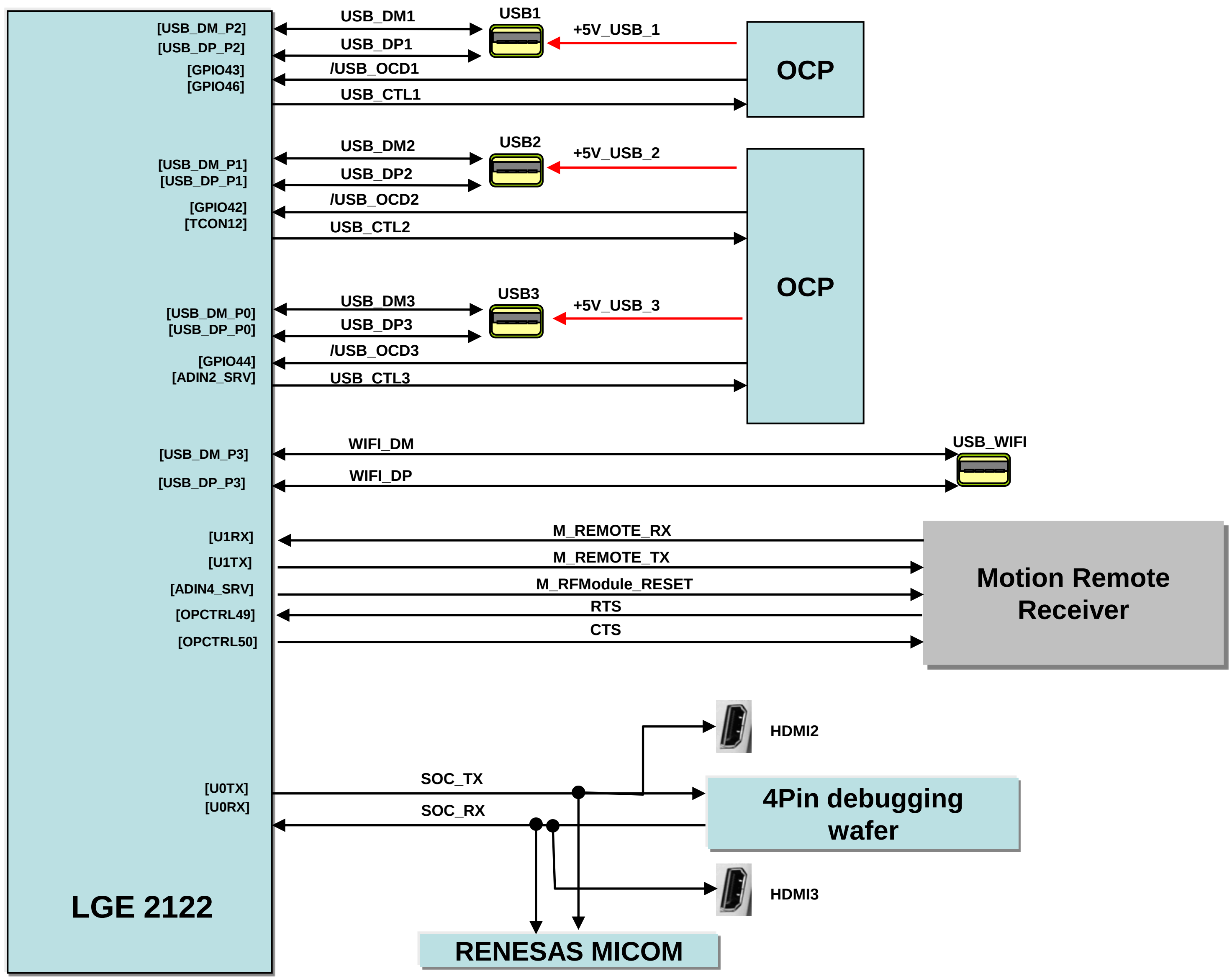
8. Panel Interface Block Diagram



9. PMIC & Level Shift Bloc Diagram

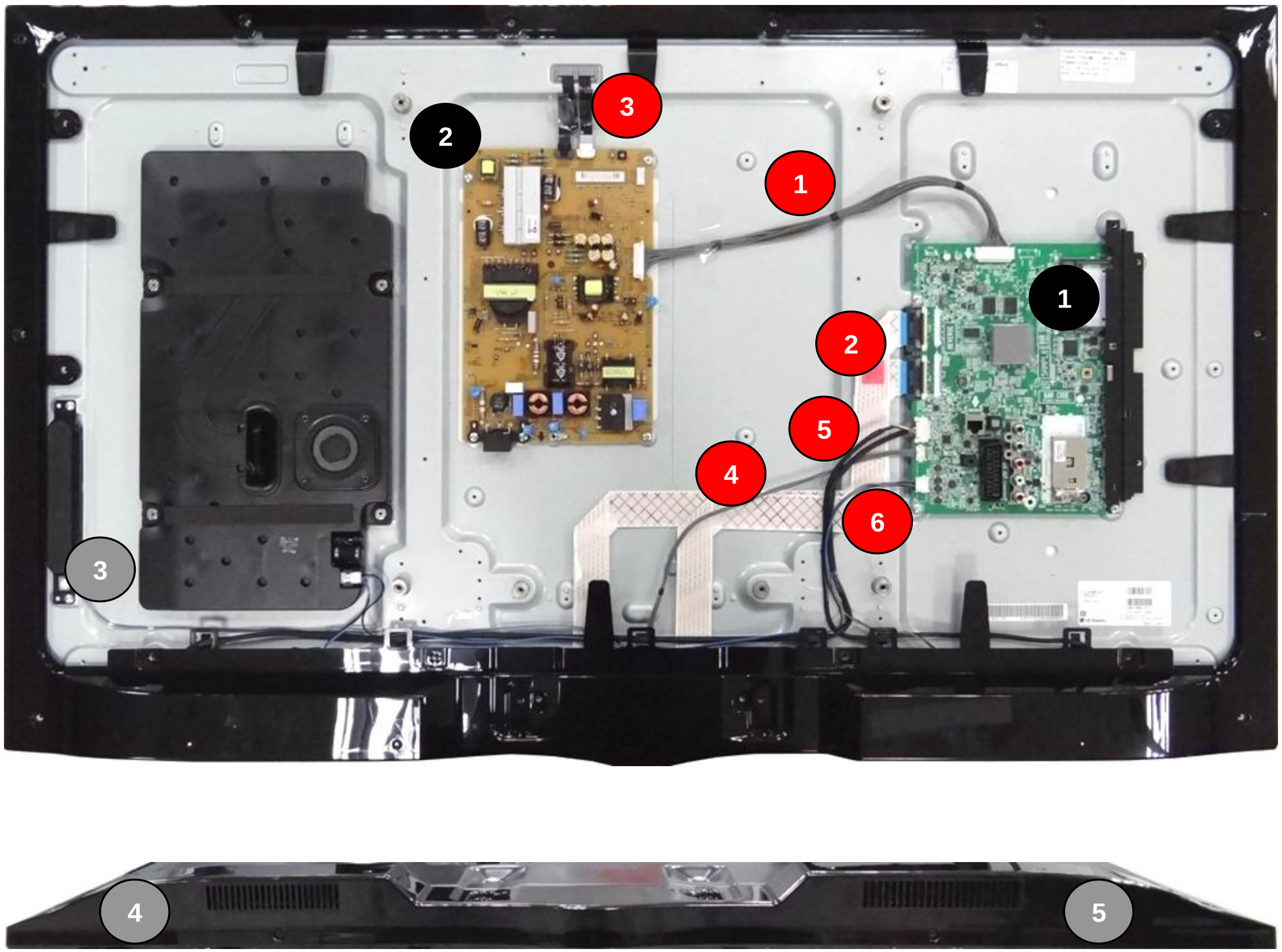


10. USB / WIFI / M-REMOTE / UART



Interconnection - 1

47LA660S-ZA



[PCBs]

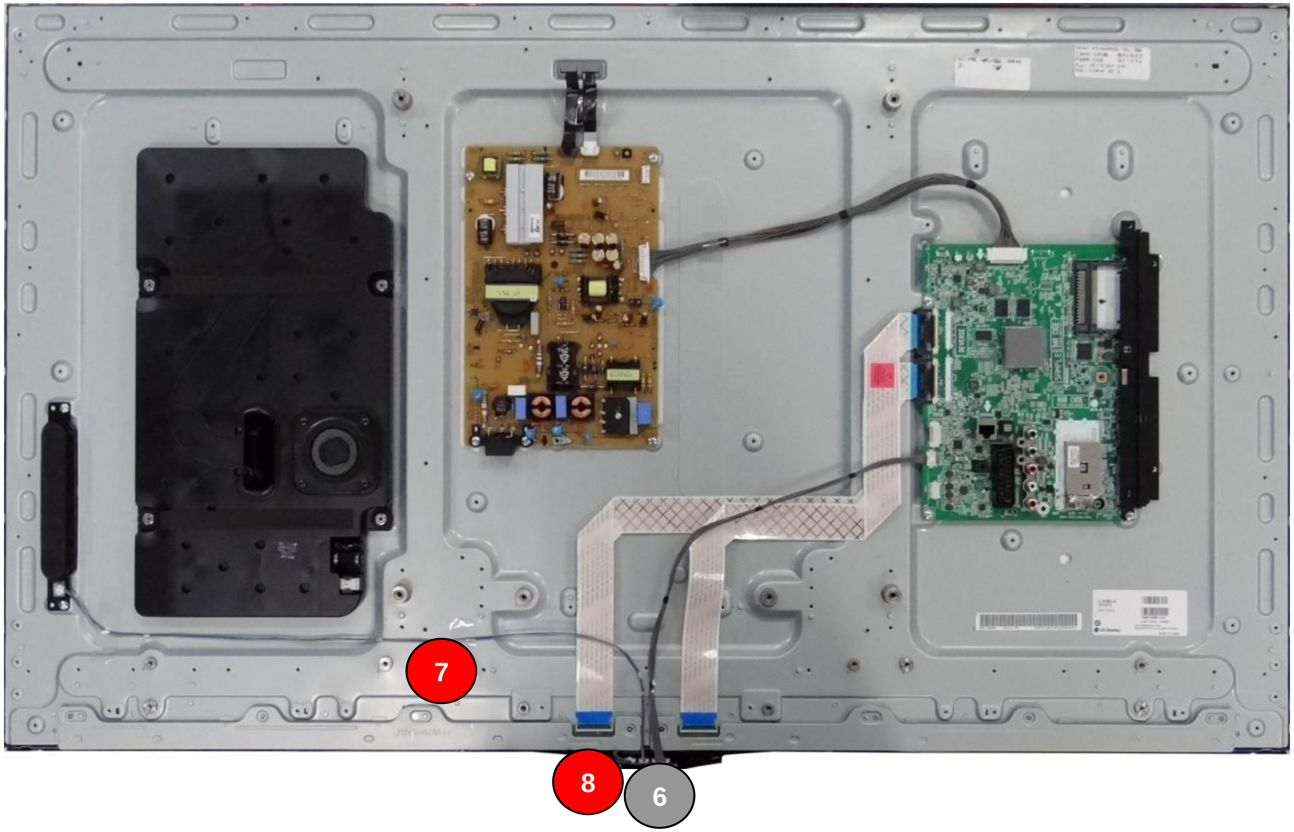
1. Main PCB
2. Power Board
3. Local key Assy
4. RF Assy
5. WIFI Assy

[Cables]

1. Main / LPB 24Pin + Local Dimming Cable
2. Main / Module EPI Cable 50& 50Pin
3. LED driver / PSU
4. IR 8Pin Cable
5. WiFi 6Pin + RF 8Pin Cable
6. SPK Cable

Interconnection - 2

47LA660S-ZA



[PCBs]

6 **IR Assy**

[Cables]

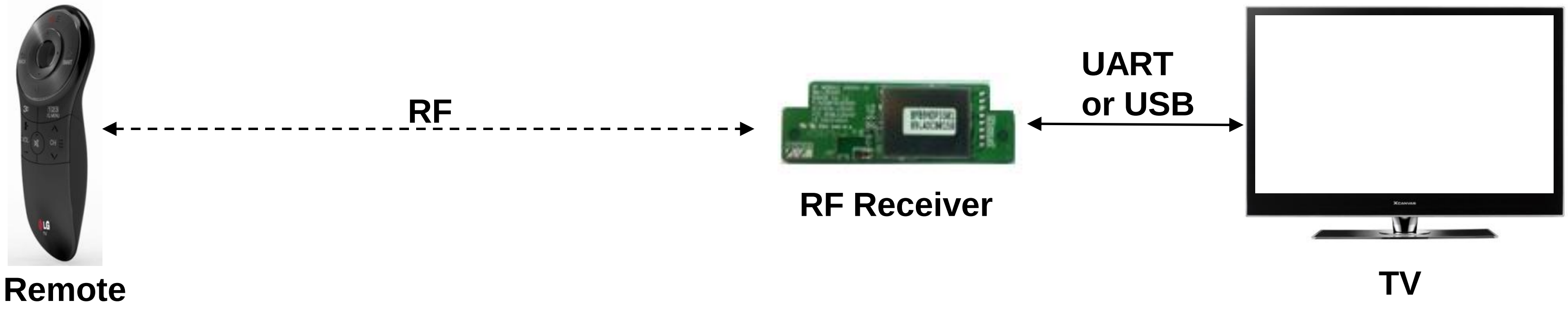
7 **IR to Local Key 3Pin Cable**

8 **IR to Logo Assy 4Pin Cable**

Introductions of 13Y RF ass'y + Magic Remote control

1. System
2. Remote Buttons
3. MR13 Block Diagram
4. Function List
5. Pairing/Un-pairing Method

1. System



❖ ***Pairing Information Transmission (Send to TV after Paired)***

- Static Calibration Data (Bypass only)
- Remote FW ver. (Save also in Receiver)
- BD_ADDR (Save also in Receiver)

• ***Pairing Information Transmission Sequence***

- When it is paired, the remote sends packets(pairing success, F/W version, BD_ADDR) to the receiver.
- The receiver sends the pairing success packet to TV directly.
- F/W version and BD_ADDR packets are just saved on the receiver.
- The receiver sends F/W version or BD_ADDR packet to TV when it is required.

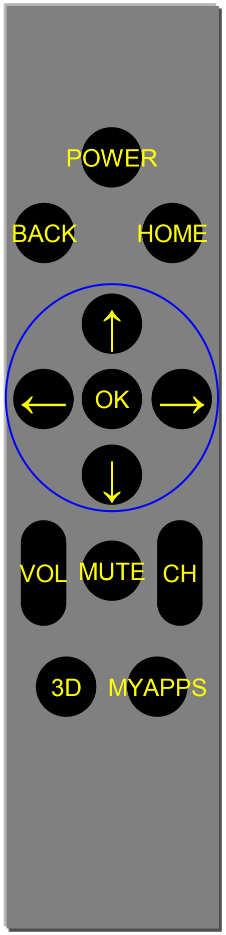
❖ ***Motion Data Transmission***

- Period : 7.5msec
- Motion Data : gyro, accelerometer

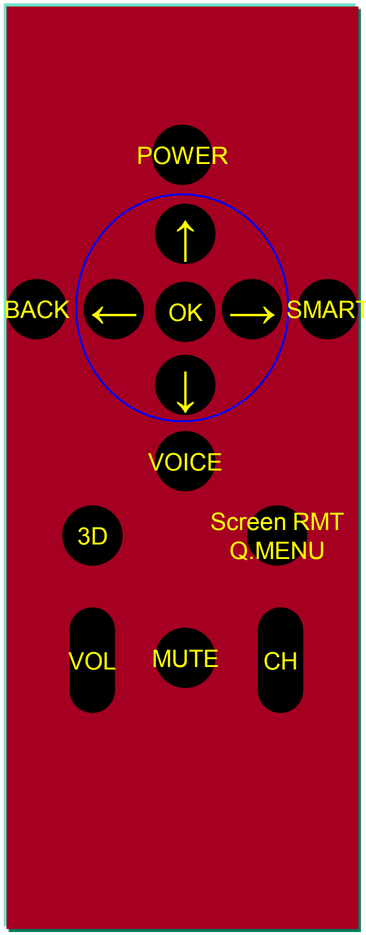
❖ ***Voice Data Transmission***

- Period : 10msec
- Voice sampling : 16khz 16bit

2. Remote Buttons (M4 vs. MR13)



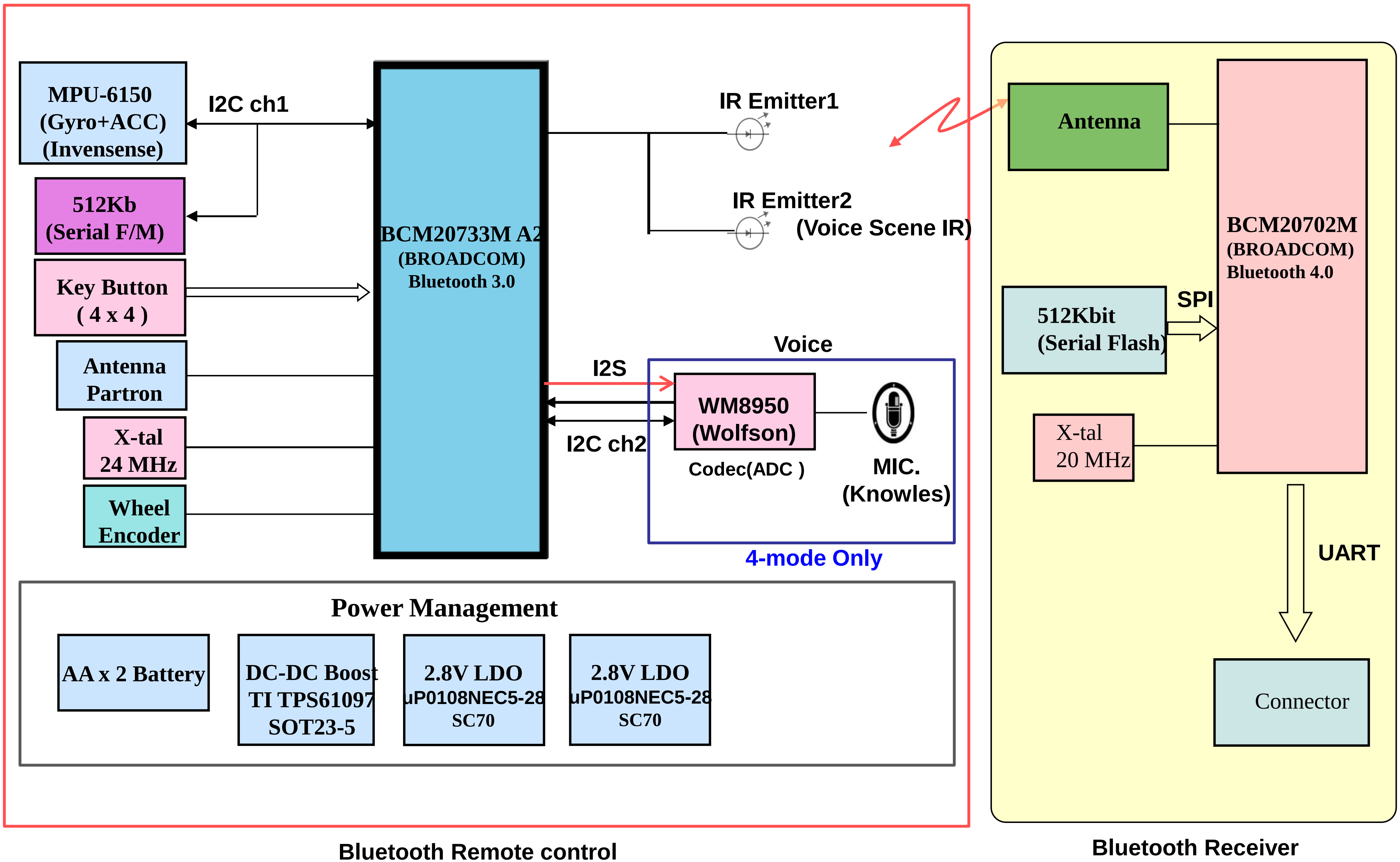
M4 Remote



MR13 Remote

BUTTON		RF Unpaired IR_CODE	RF Paired RF_CODE	IR continuous repeat	ETC.
Phsical Buttons	POWER	0x08	NONE	**Y**	IR only
	BACK	0x28	0x8028	**Y**	
	SMART	0x7C	0x807C	**Y**	
	←	0x07	0x8007	**Y**	
	→	0x06	0x8006	**Y**	
	↑	0x40	0x8040	**Y**	
	↓	0x41	0x8041	**Y**	
	OK	0x75	0x8044	**Y**	
	VOICE	0xDE	0x808B	**Y**	= VOICE_START
	3D	0xDC	0x80DC	**Y**	
	Screen RMT / Q.MENU	0xDE	0x80DE	**Y**	
	CH +	0x00	0x8000	**Y**	
	CH -	0x01	0x8001	**Y**	
	VOL +	0x02	0x8002	**Y**	
	VOL -	0x03	0x8003	**Y**	
	MUTE	0x09	0x8009	**Y**	
Logical Buttons	AUTO_WAKEUP	X	0x800C		
	VOICE_START	X	0x800A		
	VOICE_STOP	X	0x800D		
	POINT_START	X	0x803E		
	POINT_STOP	X	0x803F		

3. MR13 Block Diagram



4. Function list

주요 Item			IC	Manufacturer	Function
Remocon	Voice	Voice Codec	WM8950	Wolfson	16KHz Sampling of Audio data
		MEMS Mic.	SPU0414HR5H	Knowles	Sensing Voice
	Motion Sensor	Gyro Sensor + Accelerometer	MPU-6150	Invensense	Sensing angular velocity of X, Y, Z-axis
					Sensing device tilt (Pitch & Roll angle)
	RF + Micom	RF Antenna	SDBTPTR3015	Partron	Wireless communication
		X-tal	24MHz	Partron	
		RF + Micom	BCM20733A2	Broadcom	
	DC-DC Converter		TPS61097	TI	Battery Boost up Regulator
	LDO1		uP0108NEC5-28	uPI	RF, Gyro, Accelerometer Power Supply
	LDO2		uP0108NEC5-28	uPI	Audio Codec, Mic. Power Supply

5. RF Pairing / Un-pairing Method

	Method	Description
RF Pairing	❖ Method1 – If unpaired, just press "OK" button. – If paired, press "OK" button after unpairing. ❖ Method 2 (Repairing) – Press “BACK" button for 5 sec.	• When do pairing, the remote should make pairing request IR signal(0x75) to TV. • When TV receive the IR signal, it should send "pairing request packet" to the RF receiver. • After pairing success, the remote should blink LED for some time and TV send "pairing success packet" back to TV. • When remote try to unpairing, it doesn’t care about state of receiver(stand alone).
RF Unpairing	Press “BACK" button and “SMART" button at the same time for 5 sec.	• When remote try to unpairing, it doesn’t care about state of receiver(stand alone). • After unpairing, all pairing information should be erased. • After unpairing, LED should be blinked for 3sec. • The remote just becomes to IR mode.

Introductions of 13Y WIFI built in ass’y

1. Wi-Fi built in Ass’y feature
2. Wi-Fi built in Ass’y specification

WIFI Built in ass'y feature

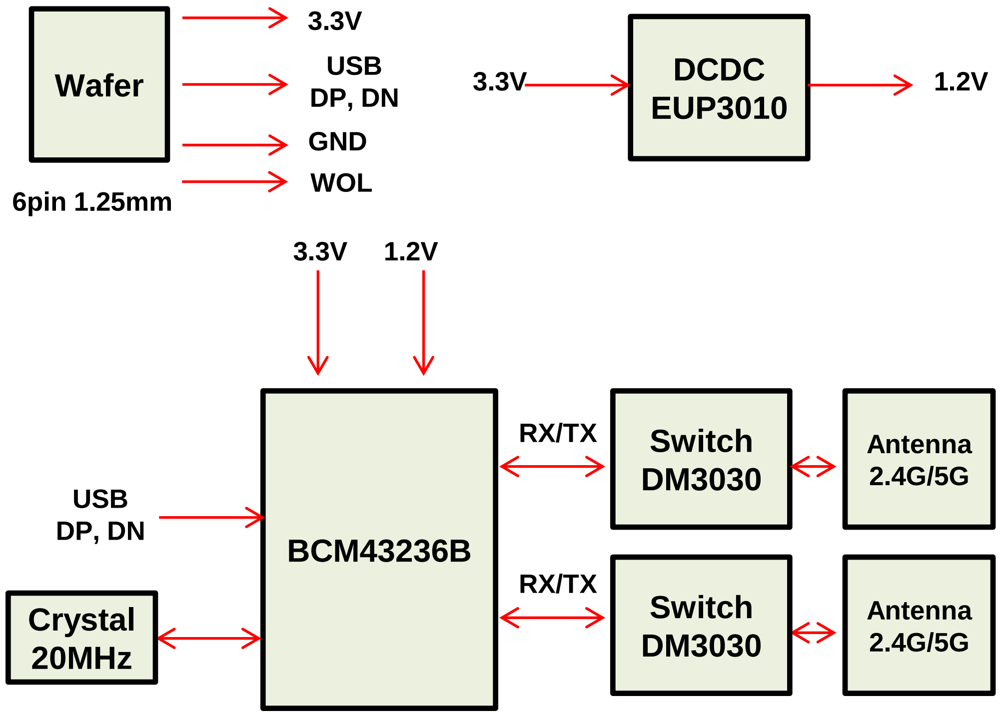
Block diagram

30



48





- Pin map

PIN	USB interface
1	Vcc
2	DM
3	DP
4	GND
5	WOW
6	NC

WIFI Built in ass'y Specification

- Frequency Band:
  - Draft 802.11n Radio: 2.4 GHz
  - 802.11g Radio: 2.4 GHz
  - 802.11b Radio: 2.4 GHz

USA – FCC	2412~2462MHz (Ch1~Ch11)
Canada – IC	2412~2462MHz (Ch1~Ch11)
Europe – ETSI	2412~2472MHz (Ch1~Ch13)
Japan – STD-T66/STD-33	2412~2484MHz (Ch1~Ch14)

802.11a Radio : 5 GHz
- 5.150~5.250GHz
- 5.725~5.850GHz

- Operating Channels:
  - IEEE 802.11b/g/n compliant:
    - 11 channels (US, Canada)
    - 13 channels (ETSI)
    - 14 channels (Japan)

- Transmit Power and Sensitivity:

TX Output Power:(Typical) (Meet emission standard)

11b	17	+/- 2 dBm
11g	14	+/- 2 dBm@54Mbps (Each chain)
11n	13	+/- 2 dBm (Each chain)

Rx Sensitivity:(Typical)
- -69dBm at HT20 m7 2.4GHz
- -87dBm at HT20 m0 2.4GHz
- -69dBm at HT20 m7 5.0GHz
- -87dBm at HT20 m0 5.0GHz

- Modulation
  - DBPSK @1Mbps
  - DQPSK@2Mbp
  - CCK@5.5/11Mbps
  - BPSK@6/9 Mbps
  - QPSK@12/18Mbps
  - 16-QAM@24Mbps
  - 64-QAM@48/54Mpb and above

- Current consumption(5V DC):
  Full load: 430mA
- Operating Temperature: 0 ~ 60 °C ambient
- Storage Temperature: -20 ~ 60 °C ambient
- Humidity: under 85% and must be non-condensing

- Regulation and certification compliance available:
  - CE
  - FCC
  - WiFi
  - WPS

Widevine & HDCP 2.0 & NETFLX

Contents

2012. 12. 08

LCD TV
LCD TV R&D Lab **/ HW1 team**

1. Widevine?

[Widevine]

Widevine is the Solution(Library) offering Adaptive Streaming and DRM.
In BBTV, when special CP do service, this module is required key.
Currently CP which is requested to widevine, is typically Australian Bigpond Live and North American CinemaNow.
Furthermore, because the future will be the spread of CP, widevine key download for the global model should be applied to production.
(Because operation unique key should be downloaded for Widevine , Widevine key dowmload by NSU is impossible.)

[Widevine Key]
Widevine Key is unique data stored TV for using Widevine.

2. HDCP 2.0 & NETFLIX?

❑ **HDCP**

✓ High-bandwidth Digital Content Protection

✓ Protect high-value digital motion pictures, television programs and audio against unauthorized interception and copying between a digital set top box or digital video recorder and a digital TV or PC.

✓ Specification developed by Intel Corporation to protect digital entertainment across the DVI/HDMI interface.

❑ Why HDCP2.0?

✓ HDCP revision 2.0 supports a broader range of wired and **wireless** interfaces.

❑ Netflix

✓ the services maintain a huge selection of movies and latest releases and offer DVD rentals via mail & online streaming.

3. DTCP?

[DTCP]

The Digital Transmission Content Protection Specification defines a cryptogrphic protocol for protecting audio/video entertainment content from unauthorized copying, intercepting, and tampering as it traverses digital transmission mechanisms such as a high-performance serial bus that conforms to the IEEE 1394-1995 standard. Only legitimate entertainment content delivered to a source device via another approved copy protection system (such as the DVD Content Scrambling System) will be protected by this protection system.

[Three cryptographic Keys]

- **Authentication Key which is formed as a result of authentication and used to protect the exchange keys.**

- **Exchage Key which is used to set up and protect content streams.**

- **Content Key which is used to encrpt the content being exchanged.**

4. Changed BOM

As-Was

Model Info

Platform	GP4	Ex) GP1R / GP2 / GP4 / Startrek
Main IC	MT5369	Ex) BCM3549 / L9 / MTK / LM1

Model Data

Tool Option1	32967	Country Group	EU
Tool Option2	41027	Country	
Tool Option3	17245	Area Code or Option	162
Tool Option4	37481		
Tool Option5	23191		
Tool Option6	1323		
Tool Option7	13615		
Commercial Tool Option			

Function

Model/SN Write	Yes	*Widevine*	Yes
CI + Download	Yes	*Built-In Wifi*	Yes
MAC Address	Yes	*DVB-S*	Yes
ESN Download	Yes	*Wasu*	NO
Marlin	NO	*CNTV*	NO
HDCP Tx	NO	*DTCP Rx*	NO
HDCP Rx	Yes		

주3) CNTV [Yes]: China Smart TV Only(CNTV ID 필요 모델)

Current

Model Info

Platform	NETCAST4	Ex) GP1R / GP2 / GP4 / Startrek
Main IC	MTK5398	Ex) BCM3549 / L9 / MTK / LM1

Model Data

Tool Option1	133	Country Group	EU
Tool Option2	12817	Country	
Tool Option3	29368	Area Code or Option	1154
Tool Option4	61754		
Tool Option5	14742		
Tool Option6	1354		
Tool Option7	47247		
Commercial Tool Option			

Function

Model/SN Write	Yes	*Widevine*	Yes
CI + Download	Yes	*Built-In Wifi*	Yes
MAC Address	Yes	*DVB-S*	Yes
ESN Download	Yes	*Wasu*	NO
Marlin	NO	*CNTV*	NO
HDCP 2.0 Tx	NO	*DTCP Rx*	NO
HDCP 2.0 Rx	Yes	*Google CA*	NO
HDCP 1.4 Rx	Yes		

주3) CNTV [Yes]: China Smart TV Only(CNTV ID 필요 모델)

❍**Changed Item**

: Separate HDCP check box.

- HDCP 2.0 Tx
- HDCP 2.0 Rx
- HDCP 1.4 Rx

Contents of LCD TV Standard Repair Process

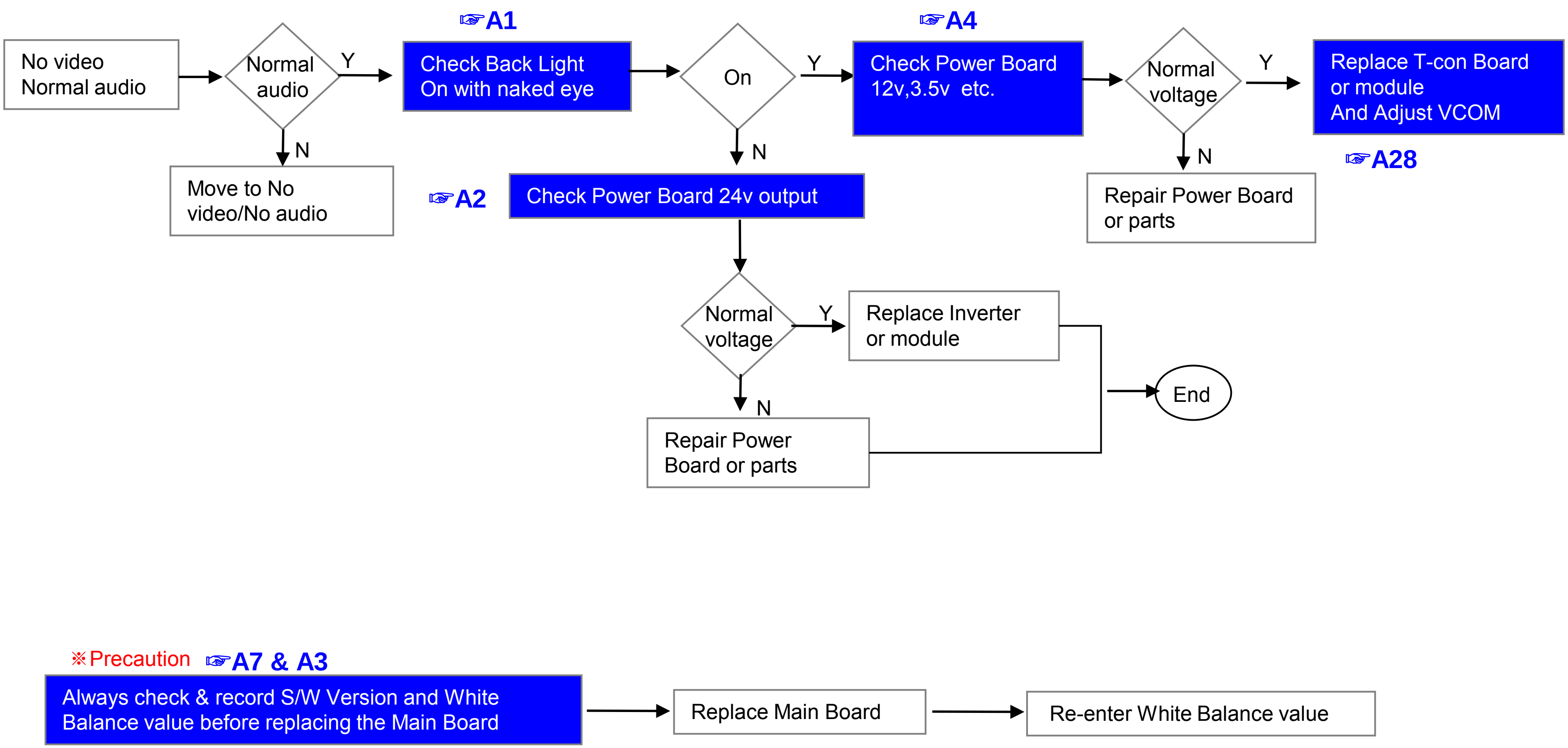
First of all, Check whether there is SVC Bulletin in GCSC System for these model.

Contents of LCD TV Standard Repair Process Detail Technical Manual

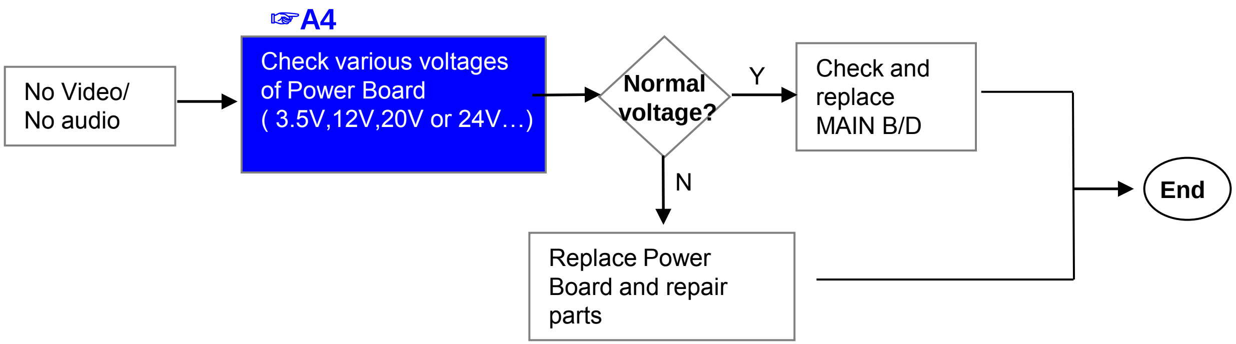
Continue to the next page

LCD TV	Error symptom	A. Video error	Established date	2012. 12 .06	
		No video/ No normal audio	Revised date		

First of all, Check whether all of cables between board is inserted properly or not.
(Main B/D↔ Power B/D, LVDS Cable,Speaker Cable,IR B/D Cable,,,)

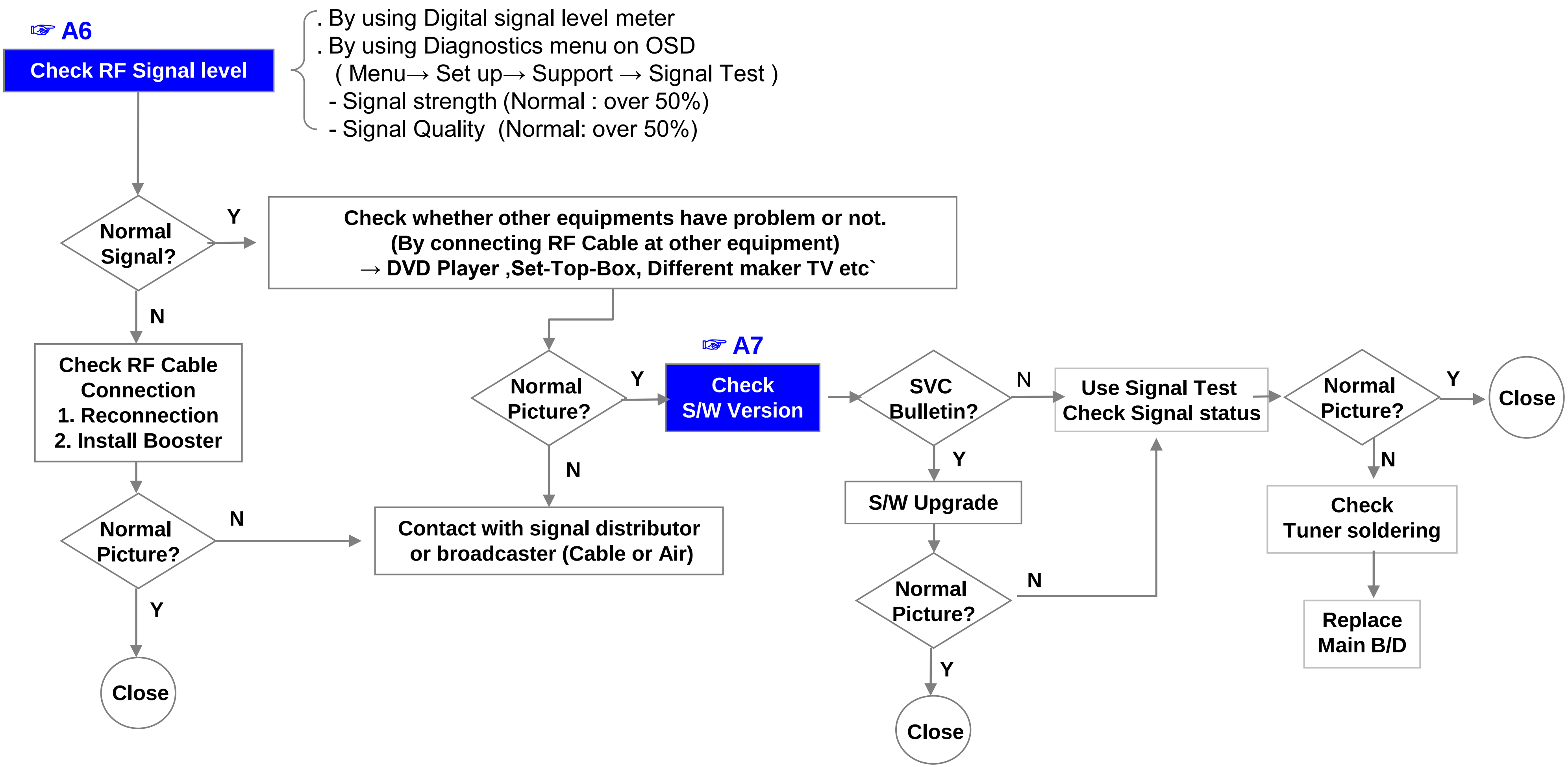


LCD TV	Error symptom	A. Video error	Established date	2012. 12 .06	
		No video/ No audio	Revised date		



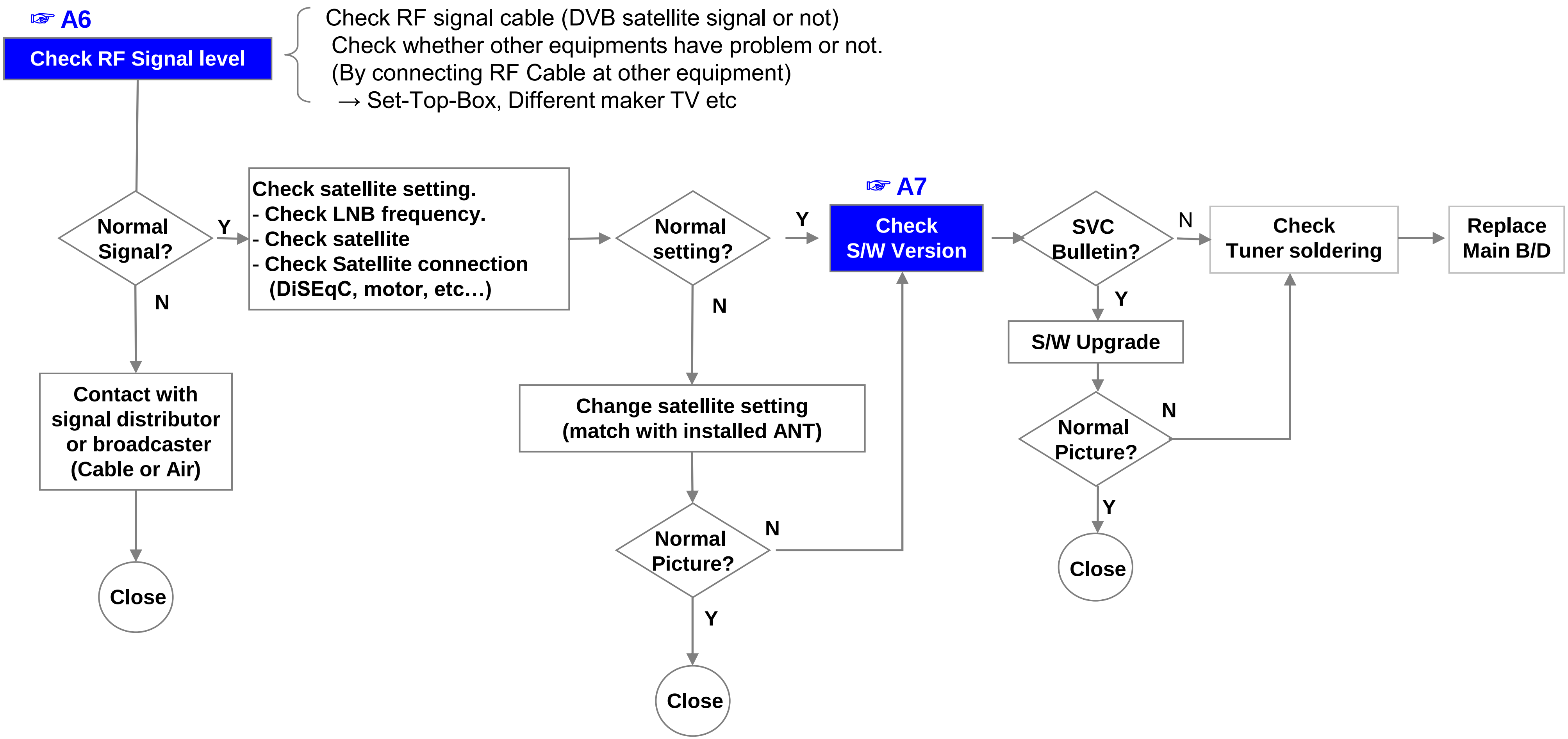
Standard Repair Process

LCD TV	Error symptom	A. Picture Problem	Established date	2012. 12 .06	
		Picture broken/ Freezing	Revised date		



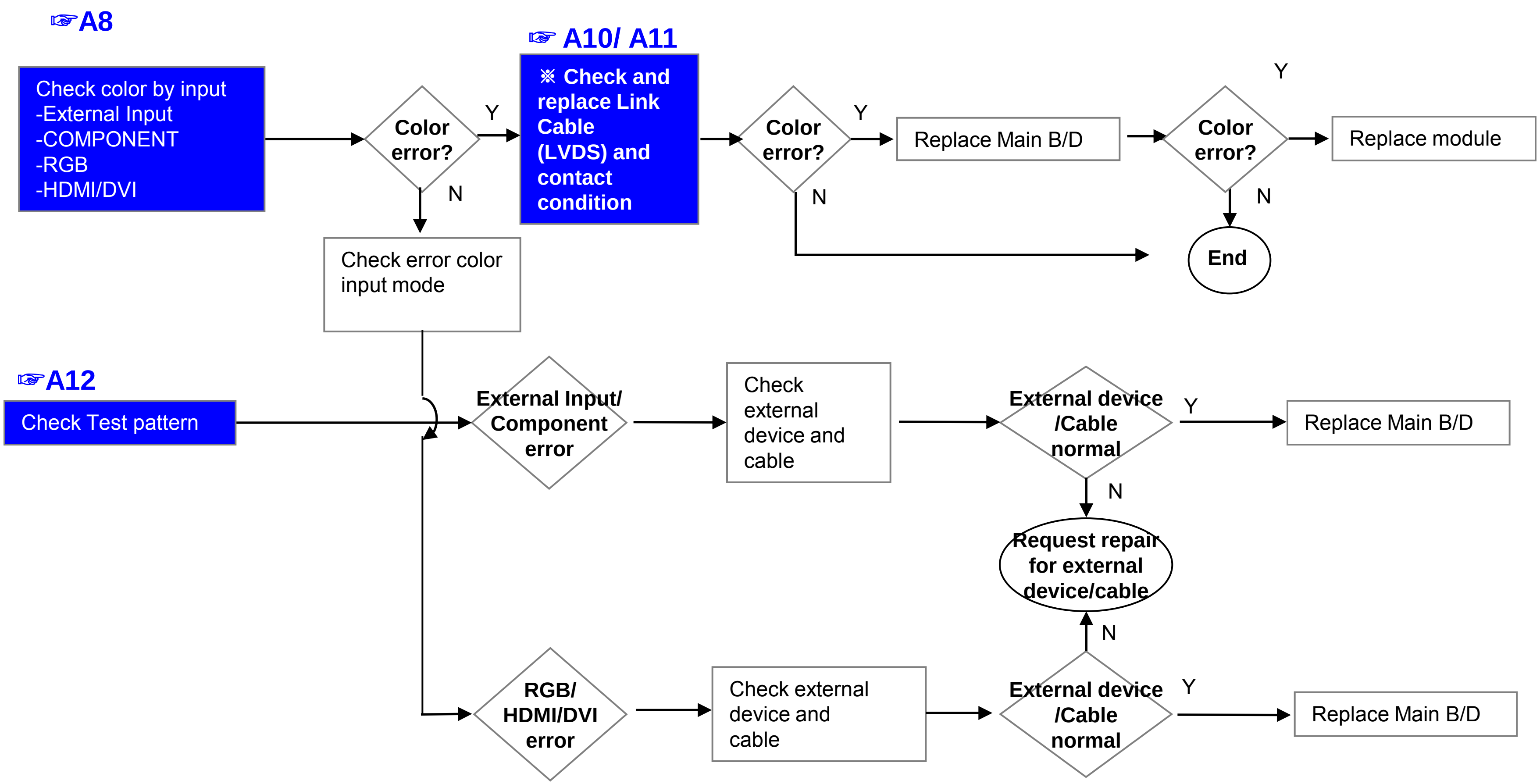
Standard Repair Process

LCD TV	Error symptom	A. Picture Problem (DVB-S/S2)	Established date	2012. 12 .06	
		Tuning fail, Picture broken/ Freezing	Revised date		



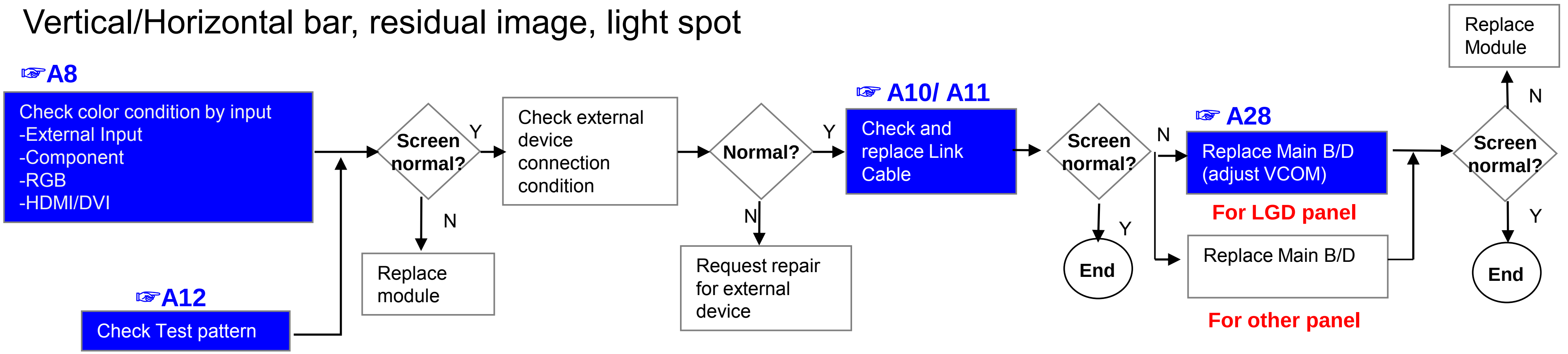
Standard Repair Process

LCD TV	Error symptom	A. Video error	Established date	2012. 12 .06	
		Color error	Revised date		

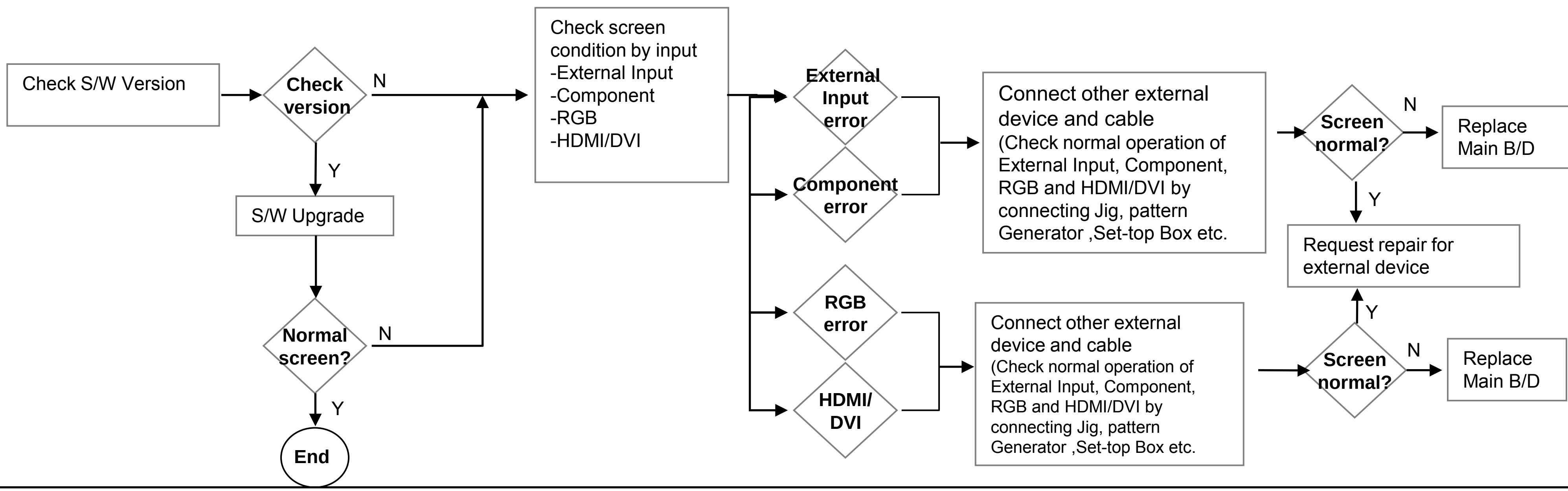


LCD TV	Error symptom	A. Video error	Established date	2012. 12 .06	
		Vertical / Horizontal bar, residual image, light spot, external device color error	Revised date		

Vertical/Horizontal bar, residual image, light spot

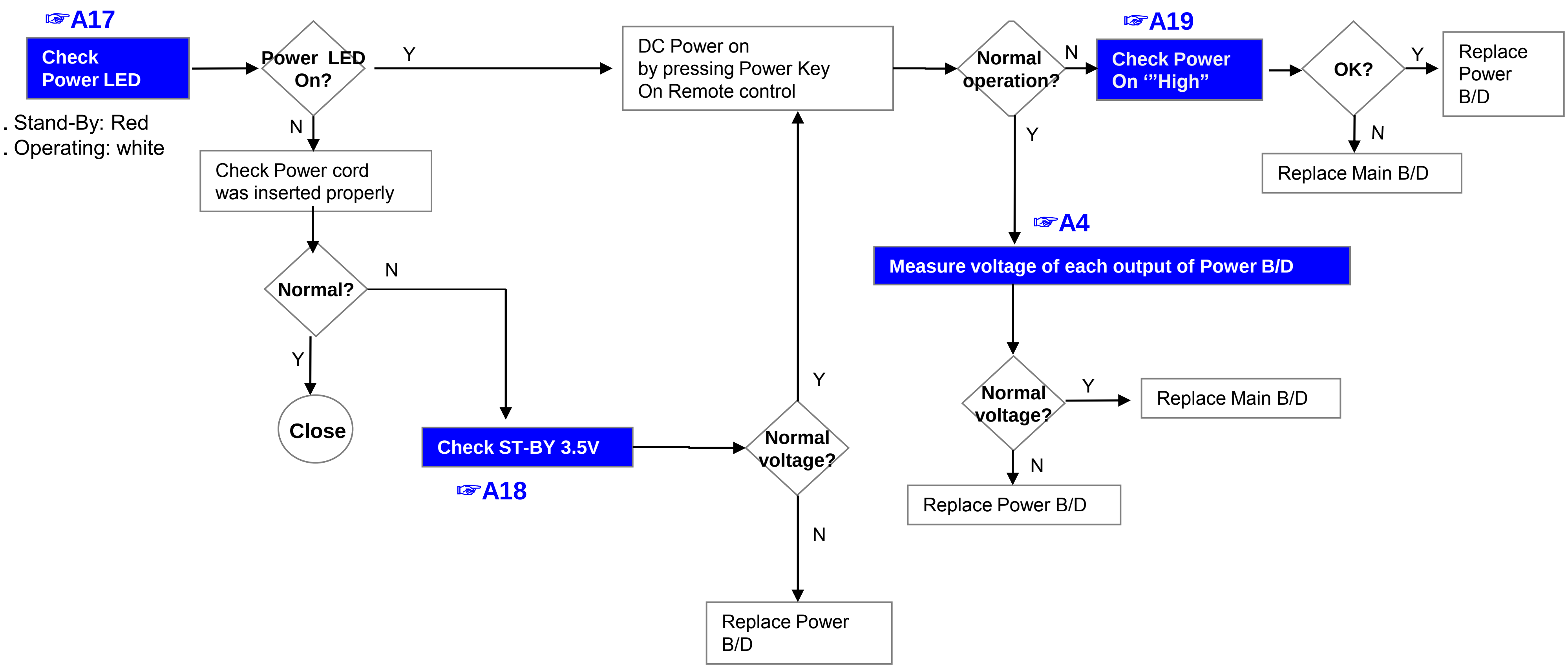


External device screen error-Color error

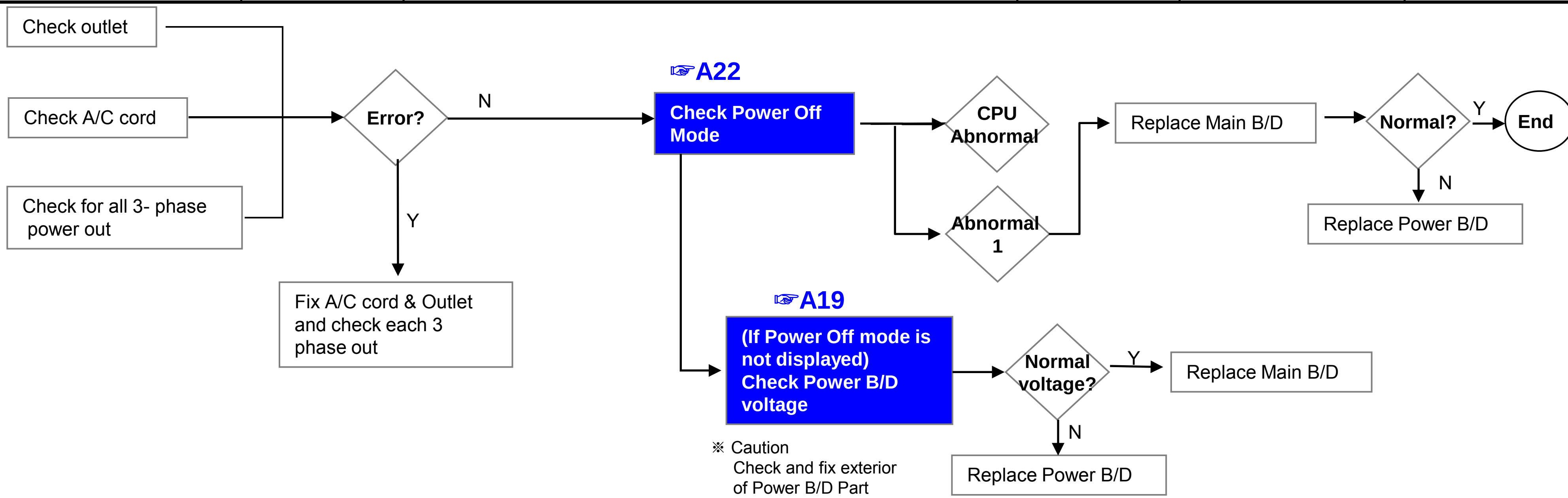


Standard Repair Process

LCD TV	Error symptom	B. Power error	Established date	2012. 12 .06	
		No power	Revised date		



LCD TV	Error symptom	B. Power error	Established date	2012. 12 .06	
		Off when on, off while viewing, power auto on/off	Revised date		

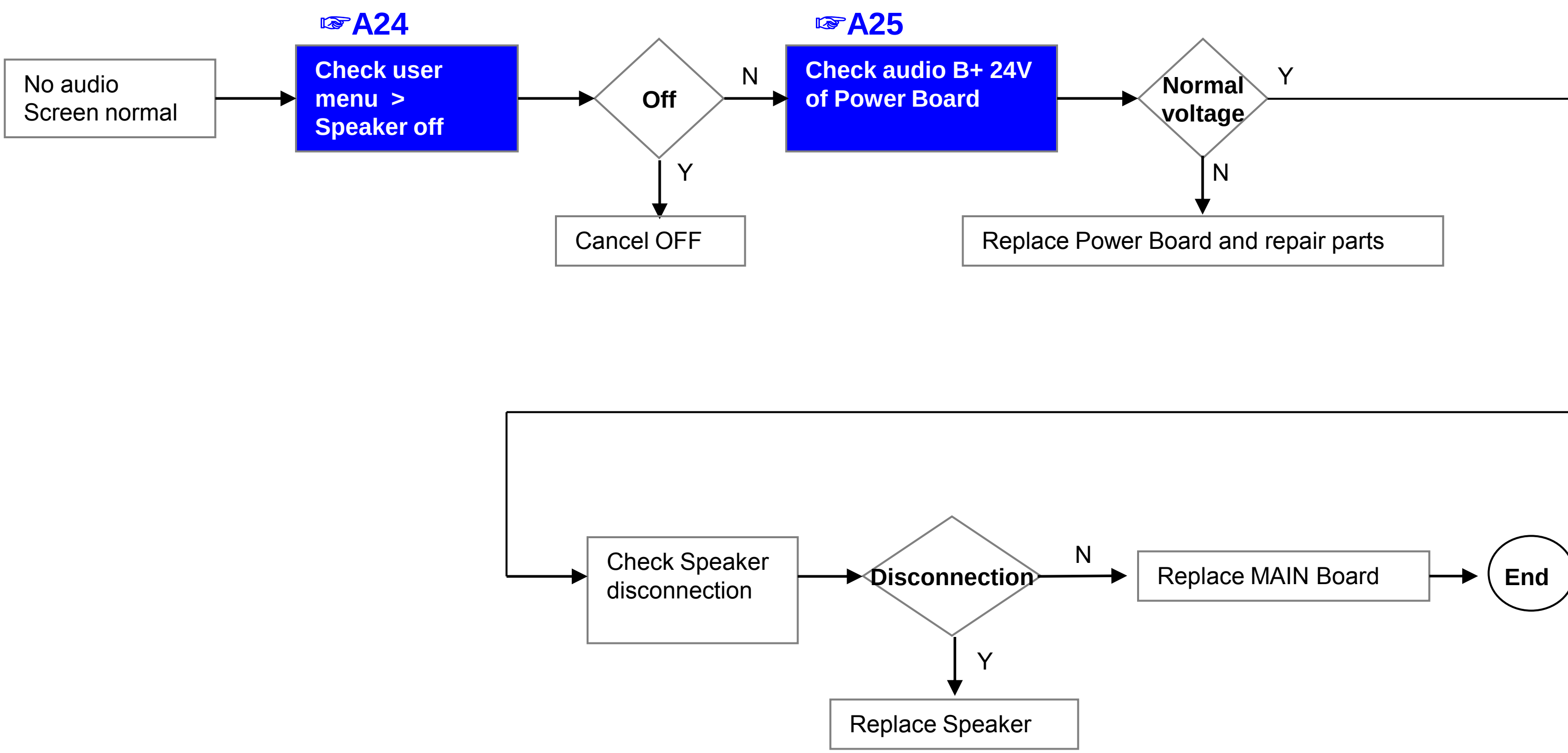


*** Please refer to the all cases which can be displayed on power off mode.**

Status	Power off List	Explanation
Normal	"POWEROFF_REMOTEKEY"	Power off by REMOTE CONTROL
	"POWEROFF_OFFTIMER"	Power off by OFF TIMER
	"POWEROFF_SLEEPTIMER"	Power off by SLEEP TIMER
	"POWEROFF_INSTOP"	Power off by INSTOP KEY
	"POWEROFF_AUTOOFF"	Power off by AUTO OFF
	"POWEROFF_ONTIMER"	Power off by ON TIMER
	"POWEROFF_RS232C"	Power off by RS232C
	"POWEROFF_RESREC"	Power off by Reservated Record
	"POWEROFF_RECEND"	Power off by End of Recording
	"POWEROFF_SWDOWN"	Power off by S/W Download
	"POWEROFF_UNKNOWN"	Power off by unknown status except listed case
Abnormal	"POWEROFF_ABNORMAL1"	Power off by abnormal status except CPU trouble
	"POWEROFF_CPUABNORMAL"	Power off by CPU Abnormal

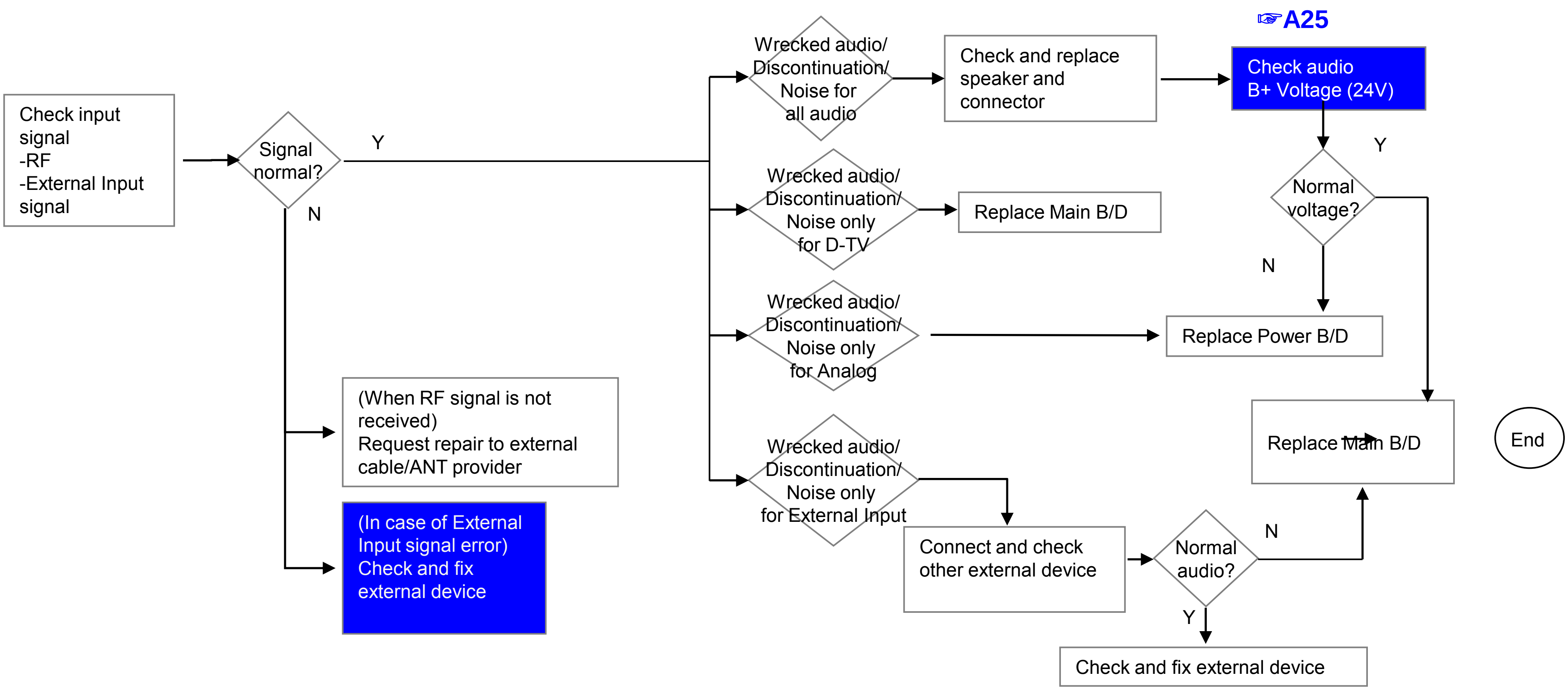
Standard Repair Process

LCD TV	Error symptom	C. Audio error	Established date	2012. 12 .06	
		No audio/ Normal video	Revised date		



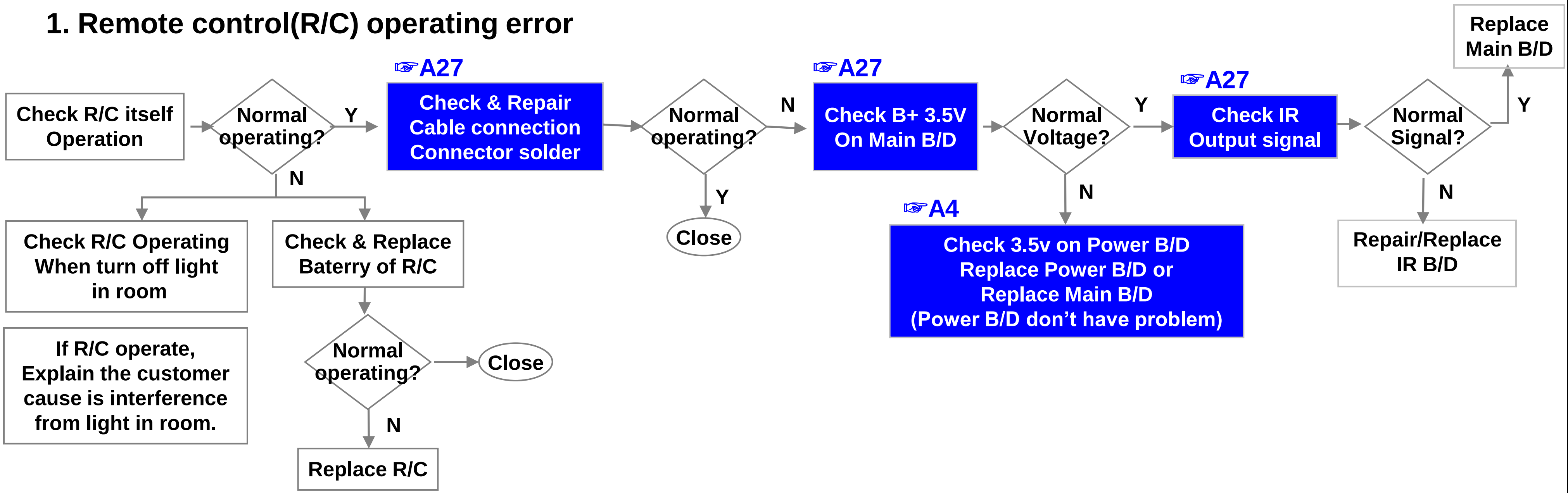
LCD TV	Error symptom	C. Audio error	Established date	2012. 12 .06	
		Wrecked audio/ discontinuation/noise	Revised date		

→ abnormal audio/discontinuation/noise is same after "Check input signal" compared to No audio

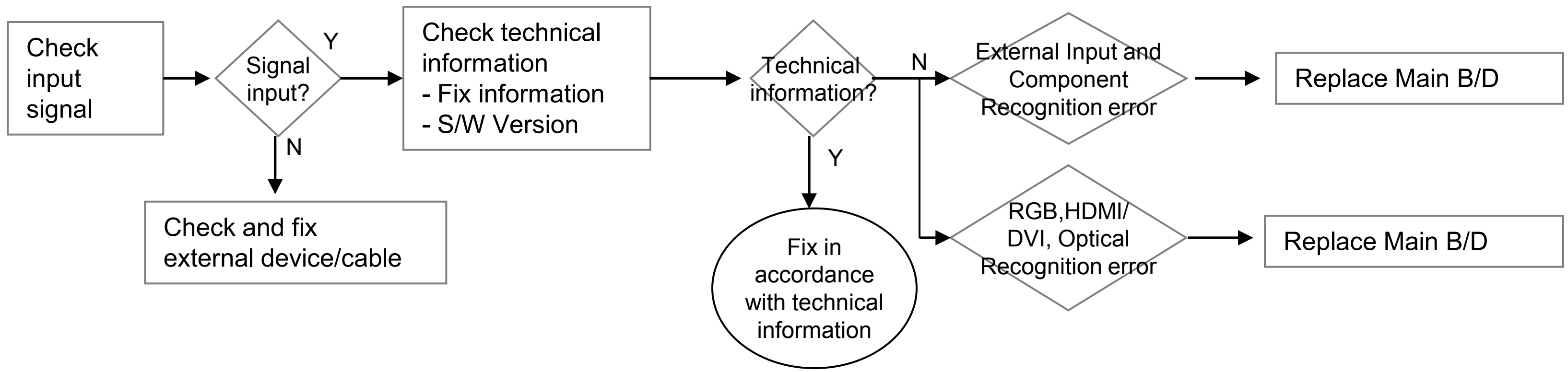


LCD TV	Error symptom	D. General Function Problem	Established date	2012. 12 .06	
		Remote control & Local switch checking	Revised date		

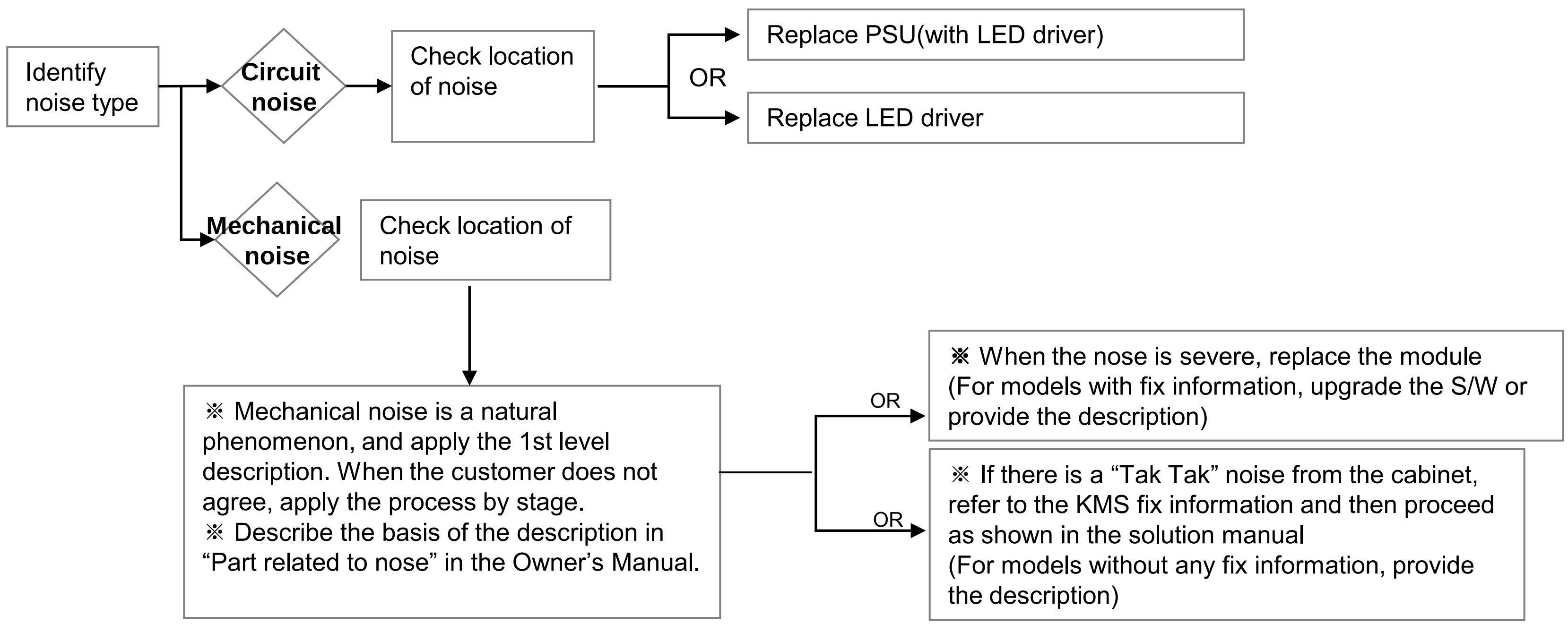
1. Remote control(R/C) operating error



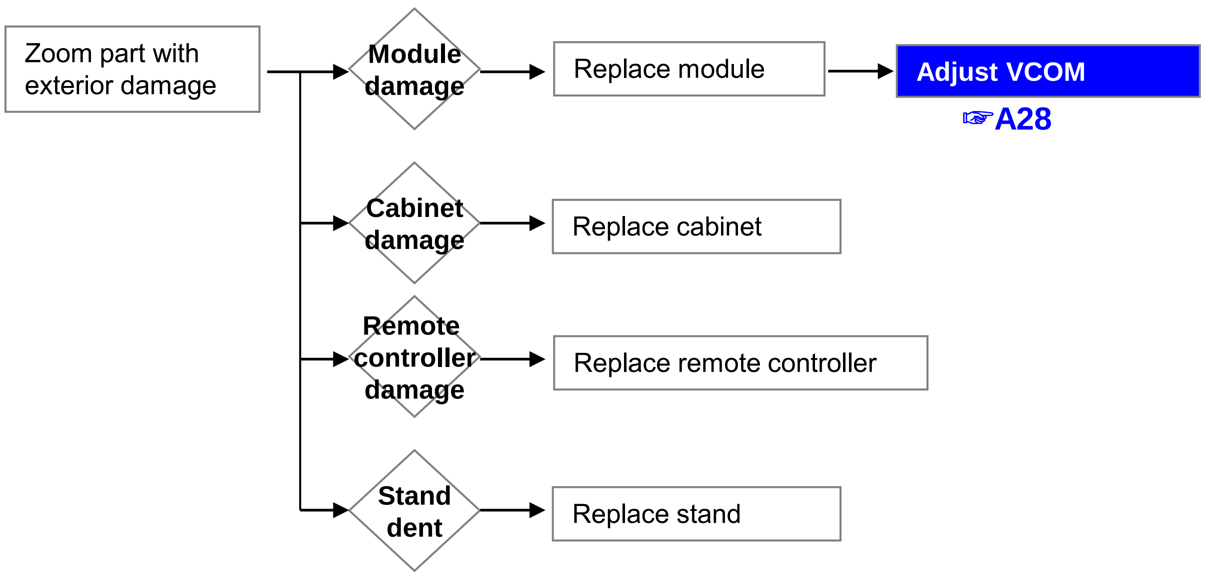
LCD TV	**Error symptom**	**D. Function error**	**Established date**	**2012. 12 .06**	
		External device recognition error	**Revised date**		



LCD TV	Error symptom	E. Noise	Established date	2012. 12 .06	
		Circuit noise, mechanical noise	Revised date		

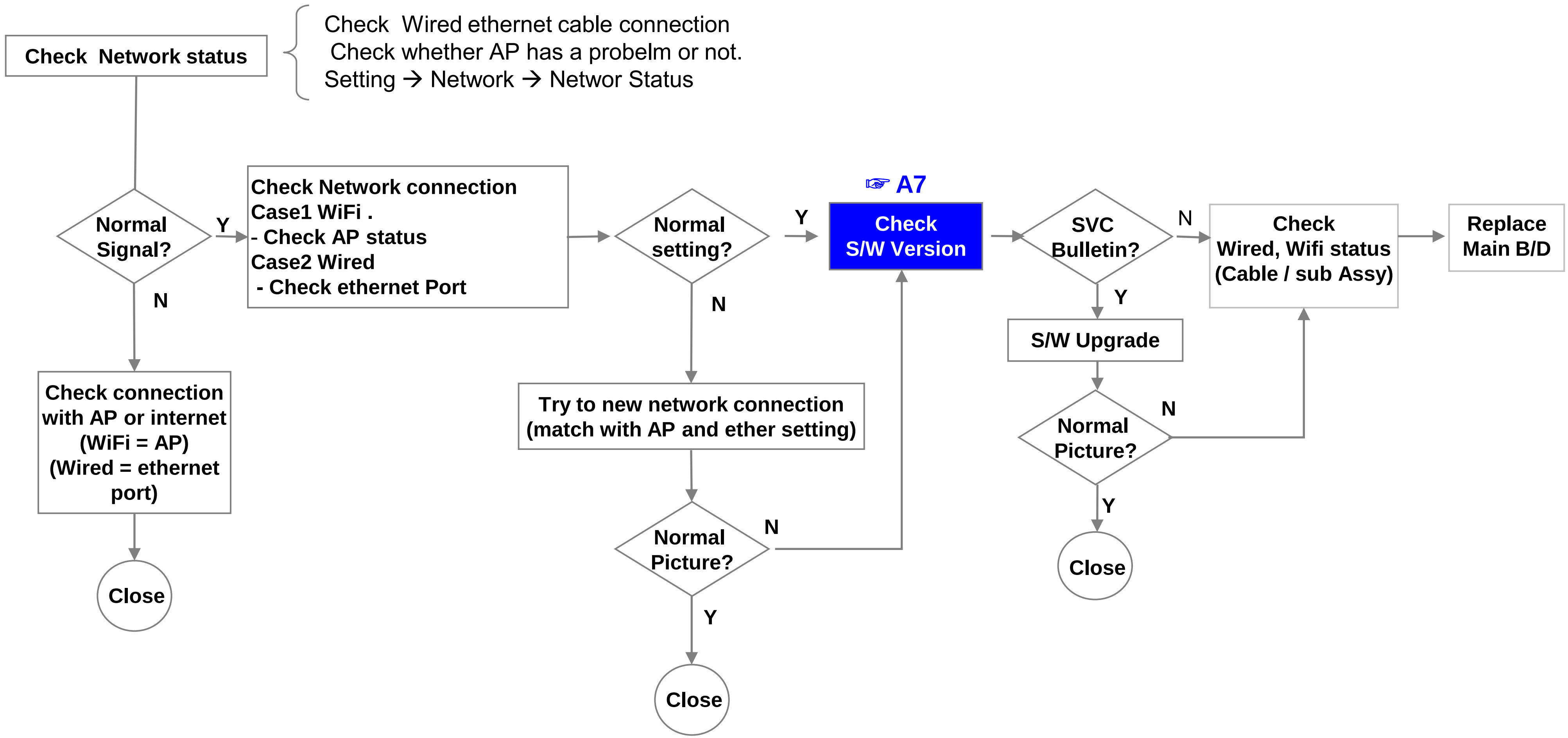


LCD TV	Error symptom	F. Exterior defect	Established date	2012. 12 .06	
		Exterior defect	Revised date		

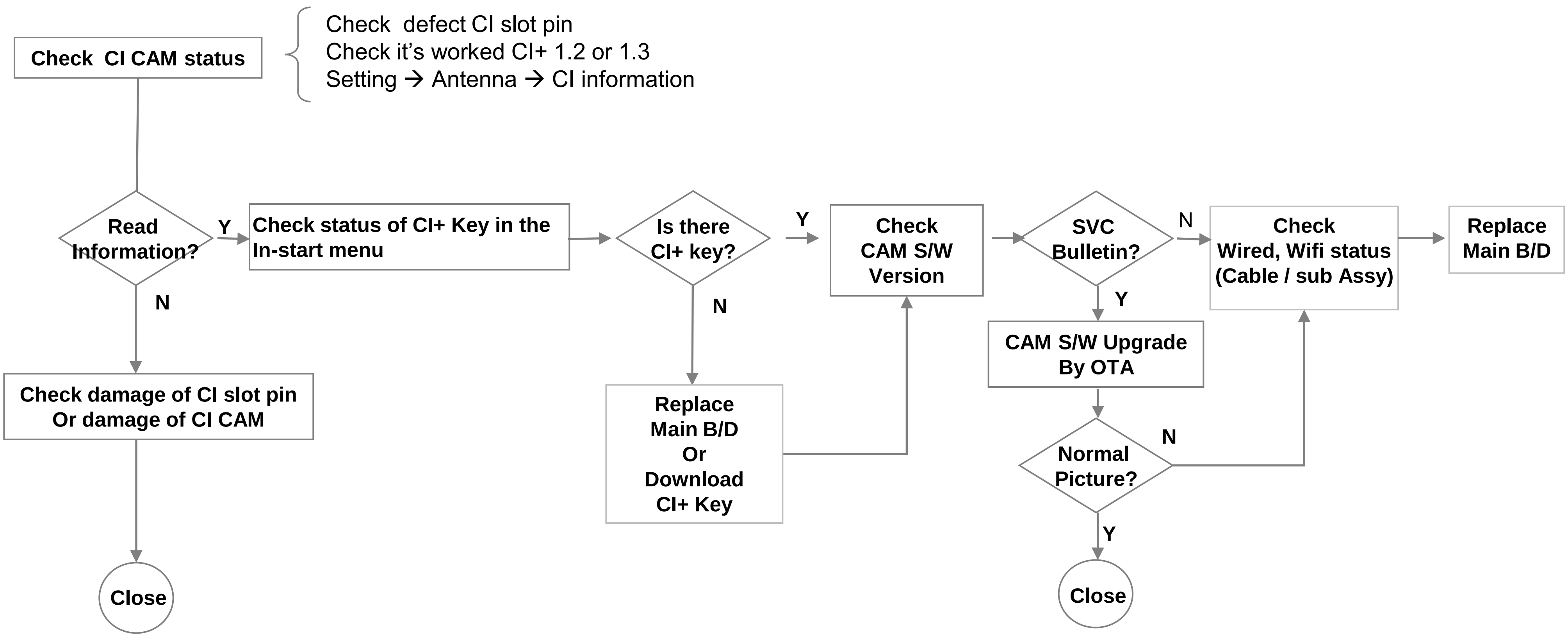


Standard Repair Process

LCD TV	Error symptom	G. Network Error	Established date	2012. 12 .06	
		Exterior defect	Revised date		



LCD TV	Error symptom	G. CI+ Competibility Error	Established date	2012. 12 .06	
		Exterior defect	Revised date		

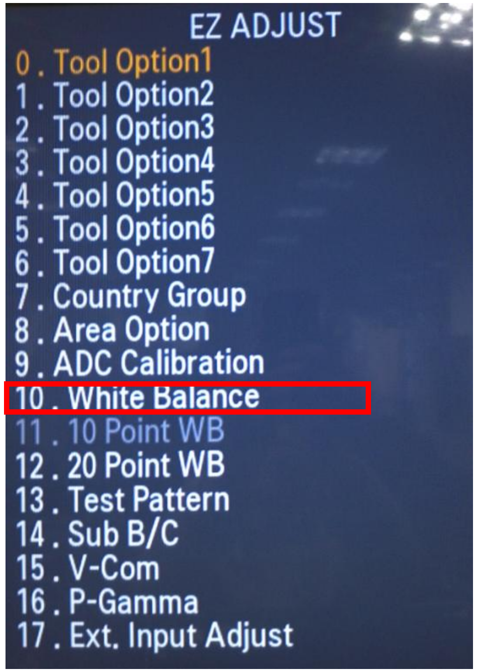


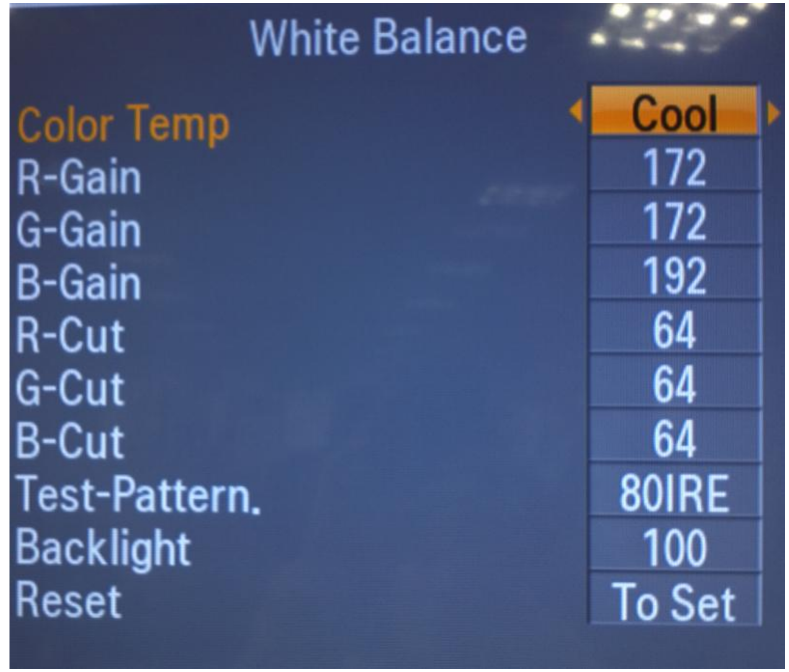
Old version of CI+ 1.2 CAM is not worked at the TV that is supported CI+ 1.3
→ Check SVC Bulletin

Contents of LCD TV Standard Repair Process Detail Technical Manual

Continued from previous page

<ALL MODELS>





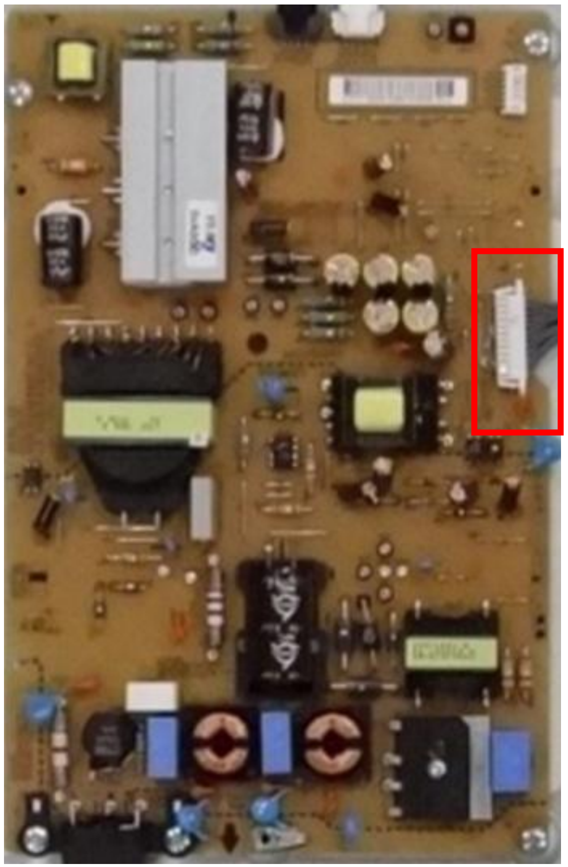
Entry method

1. Press the ADJ button on the remote controller for adjustment.

2. Enter into White Balance of item 10.

3. After recording the R, G, B (GAIN, Cut) value of Color Temp (Cool/Medium/Warm), re-enter the value after replacing the MAIN BOARD.

LCD TV	Error symptom	A. Video error_No video/ Audio	Established date	2012. 12 .06	
	Content	Power Board voltage measuring method	Revised date		A5



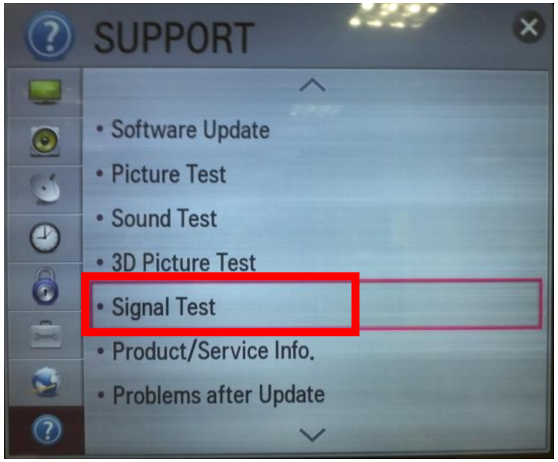
Check the DC 24V, 12V, 3.5V.

24 Pin (Power Board ↔ Main Board)			
SMAW200-H24S			
1	Power on	2	Inverter On/off
3	3.5V	4	PWM Dim #1
5	3.5V	6	PWM Dim #2
7	GND	8	GND
9	24V	10	24V
11	GND	12	GND
13	12V	14	12V
15	12V	16	24V
17	GND	18	GND
19	GND	20	GND
21	GND	22	L/DIMO_VS
23	L/DIM0_MOSI	24	L/DIM0_SCLK

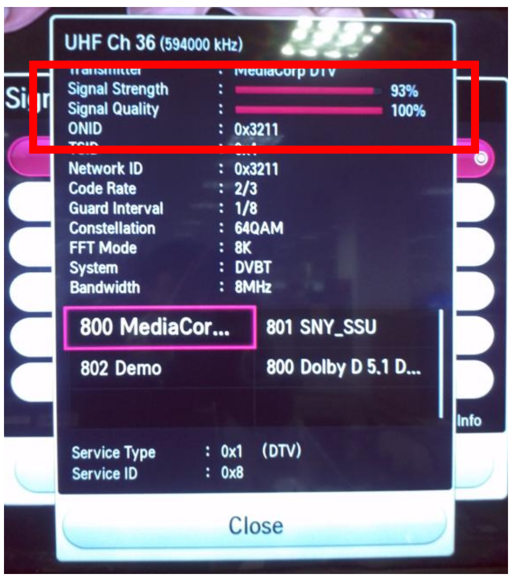
Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_Video error, video lag/stop	Established date	2012. 12 .06	
	Content	TUNER input signal strength checking method	Revised date		A6

<ALL MODELS>



MENU → support → signal test
→ select channel



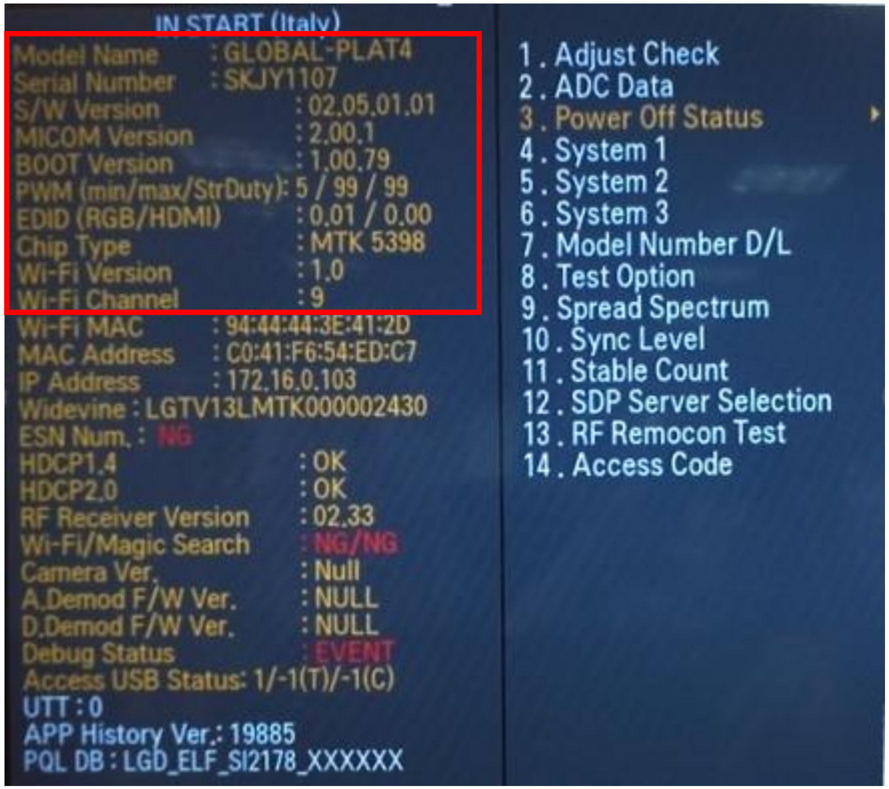
When the signal is strong, use the attenuator (-10dB, -15dB, -20dB etc.)



<ALL MODELS>

1. Checking method for remote controller for adjustment

Version





Press the IN-START with the remote controller for adjustment

LCD TV	Error symptom	A. Video error _Vertical/Horizontal bar, residual image, light spot	Established date	2012. 12 .06	
	Content	LCD TV connection diagram (1)	Revised date		A8

<ALL MODELS>



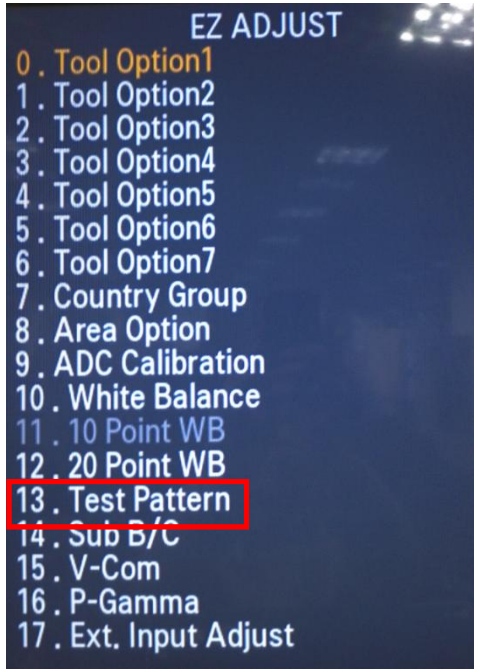
As the part connecting to the external input, check the screen condition by signal

<ALL MODELS>



Checking method:
1. Check the signal strength or check whether the screen is normal when the external device is connected.
2. After measuring each voltage from power supply, finally replace the MAIN BOARD.

















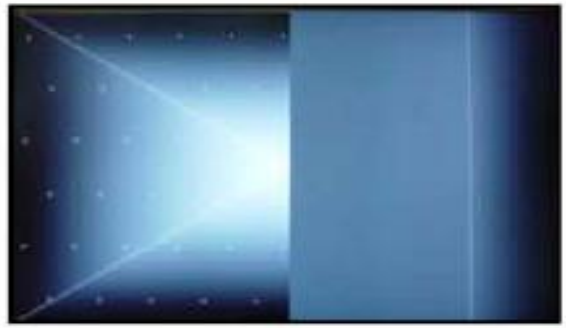
You can view 6 types of patterns using the ADJ Key

Checking item : 1. Defective pixel 2. Residual image 3. MODULE error (ADD-BAR,SCAN BAR..)
4.Video error (Classification of MODULE or Main-B/D!)

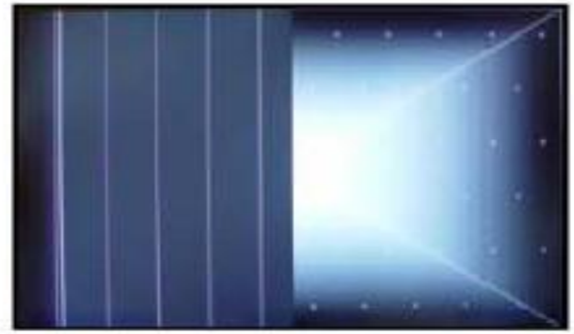
Appendix : Exchange EPI Cable or Main B/D (1)



Solder defect, CNT Broken



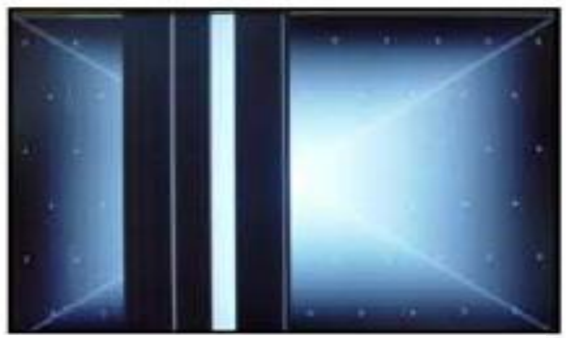
Solder defect, CNT Broken



Solder defect, CNT Broken



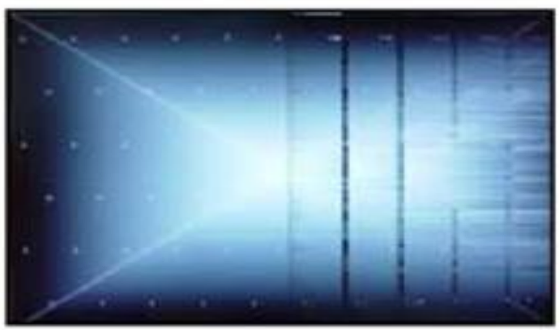
Solder defect, CNT Broken



Solder defect, CNT Broken



Abnormal Power Section



Solder defect, Short/Crack

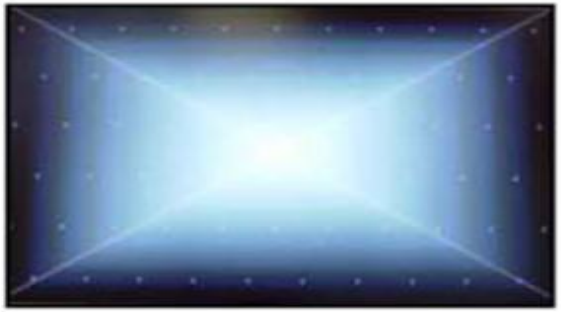


Abnormal Power Section



Solder defect, Short/Crack

Appendix : Exchange EPI Cable or Main B/D (2)



Abnormal Power Section



Abnormal Power Section



Solder defect, Short/Crack



Solder defect, Short/Crack



Fuse Open, Abnormal power section



Abnormal Display



GRADATION



Noise



GRADATION

Appendix : Exchange LPB(LED driver)



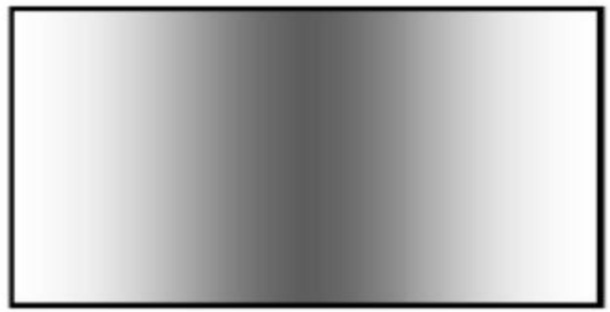
No Light



Dim Light



Dim Light



Dim Light

Appendix : Exchange the Module (1)



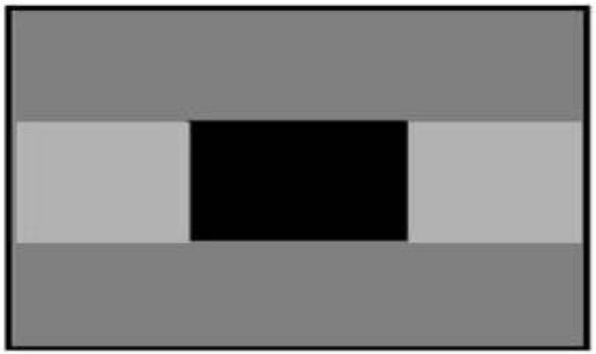
Panel Mura, Light leakage



Panel Mura, Light leakage



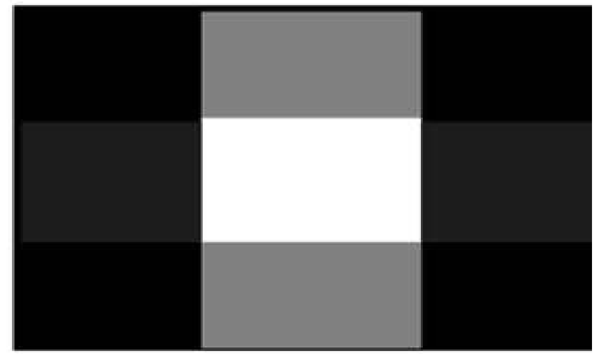
Press damage



Crosstalk



Press damage



Crosstalk

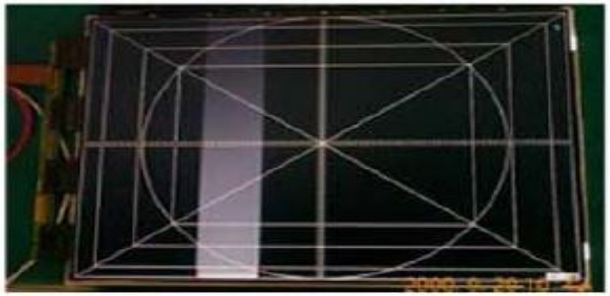


Press damage

Un-repairable Cases

In this case please exchange the module.

Appendix : Exchange the Module (2)



Vertical Block
Source TAB IC Defect



Vertical Line
Source TAB IC Defect



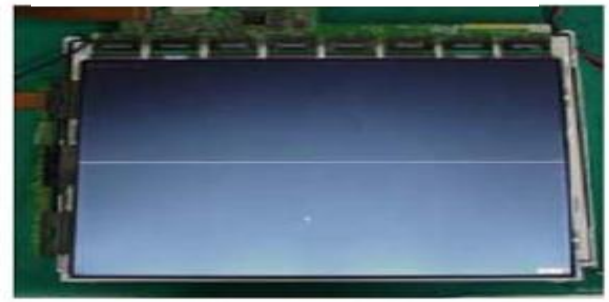
Vertical Block
Source TAB IC Defect



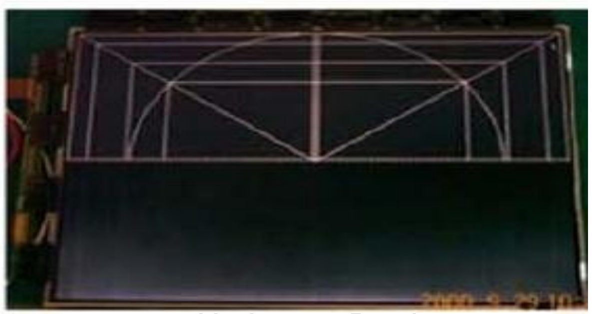
Horizontal Block
Gate TAB IC Defect



Horizontal Block
Gate TAB IC Defect



Horizontal line
Gate TAB IC Defect

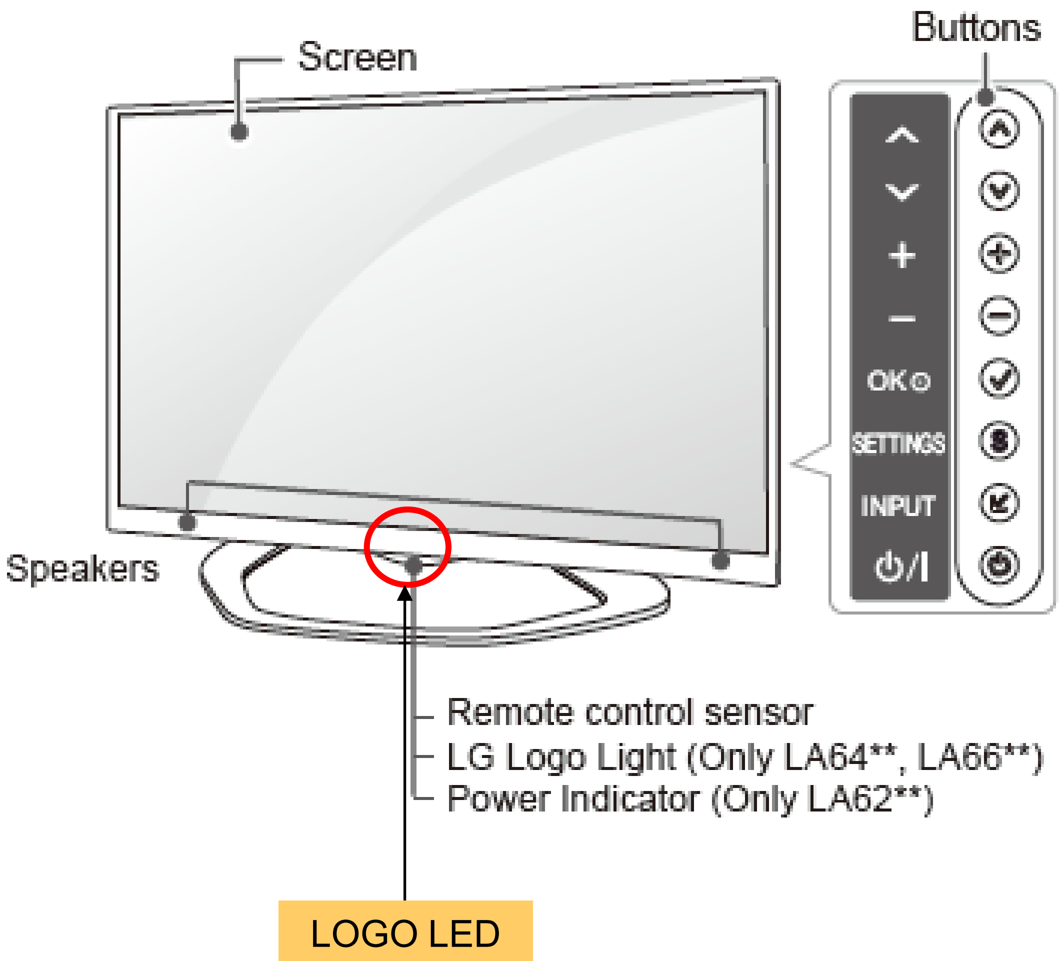


Horizontal Block
Gate TAB IC Defect

Un-repairable Cases

In this case please exchange the module.

LCD TV	Error symptom	B. Power error _No power	Established date	2012. 12 .06	
	Content	Check front display LED	Revised date		A17



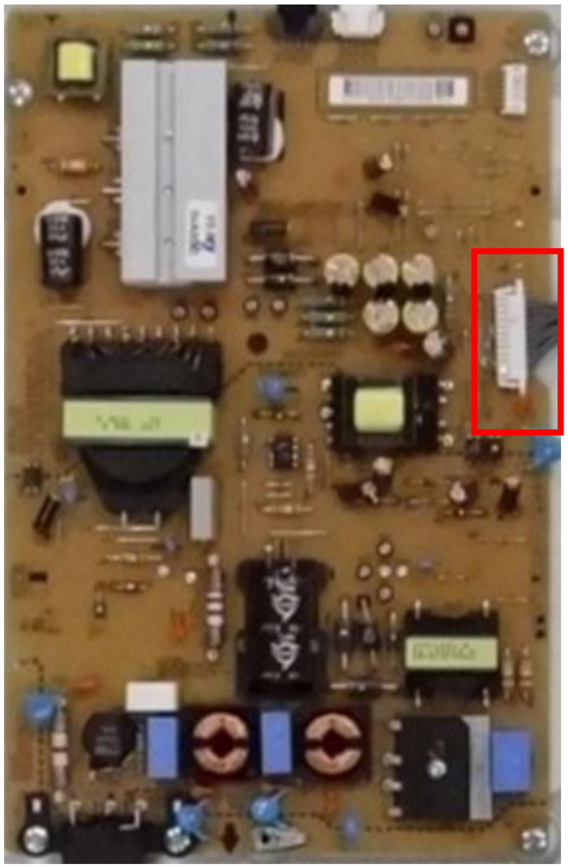
You can set the LG Logo Light to on or off by selecting OPTION in the main menus.

Front LOGO LED control in the status of ST-BY Condition:
Menu → Option → LG Logo Light
→ Brightness(OFF,LOW,MIDDLE,HIGH)

Front LOGO LED control in the status of Power On Condition:
Menu → Option → LG Logo Light
→ Duration(off, off after10min)

LCD TV	Error symptom	B. Power error _No power	Established date	2012. 12 .06	
	Content	Check power input voltage and ST-BY 3.5V	Revised date		A18

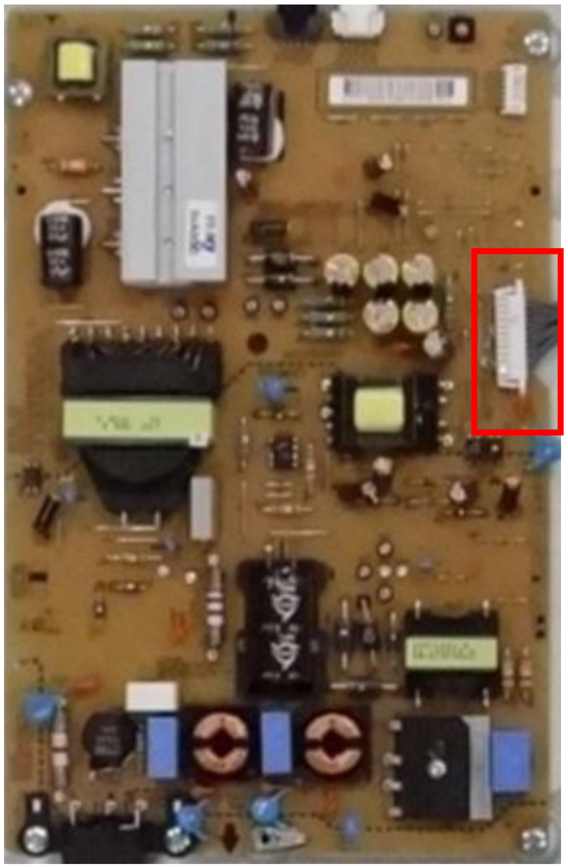
For '10 models, there is no voltage out for st-by purpose.
When st-by, only 3.5V is normally on.



Check the DC 24V, 12V, 3.5V.

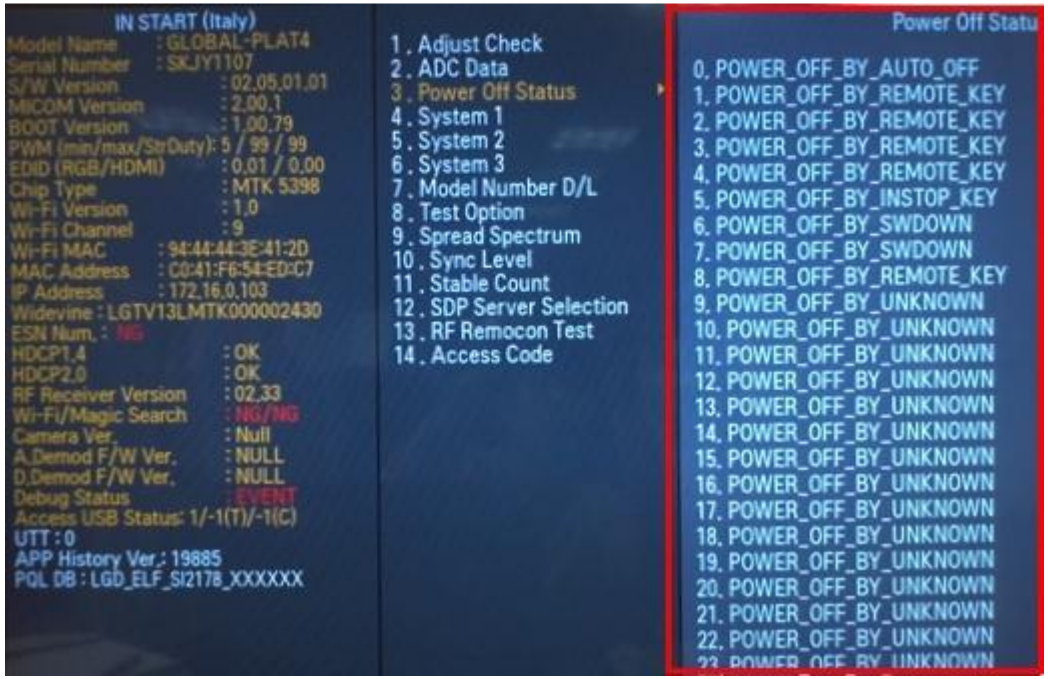
24 Pin (Power Board ↔ Main Board)			
SMAW200-H24S			
1	Power on	2	Inverter On/off
3	3.5V	4	PWM Dim #1
5	3.5V	6	PWM Dim #2
7	GND	8	GND
9	24V	10	24V
11	GND	12	GND
13	12V	14	12V
15	12V	16	24V
17	GND	18	GND
19	GND	20	GND
21	GND	22	L/DIMO_VS
23	L/DIM0_MOSI	24	L/DIM0_SCLK

Check “power on” pin is high



24 Pin (Power Board ↔ Main Board)			
SMAW200-H24S			
1	Power on	2	Inverter On/off
3	3.5V	4	PWM Dim #1
5	3.5V	6	PWM Dim #2
7	GND	8	GND
9	24V	10	24V
11	GND	12	GND
13	12V	14	12V
15	12V	16	24V
17	GND	18	GND
19	GND	20	GND
21	GND	22	L/DIMO_VS
23	L/DIM0_MOSI	24	L/DIM0_SCLK

<ALL MODELS>



Entry method

1. Press the IN-START button of the remote controller for adjustment

2. Check the entry into adjustment item 3

LCD TV	Error symptom	C. Audio error_No audio/Normal video	Established date	2012. 12 .06	
	Content	Checking method in menu when there is no audio	Revised date		A24

<ALL MODELS>



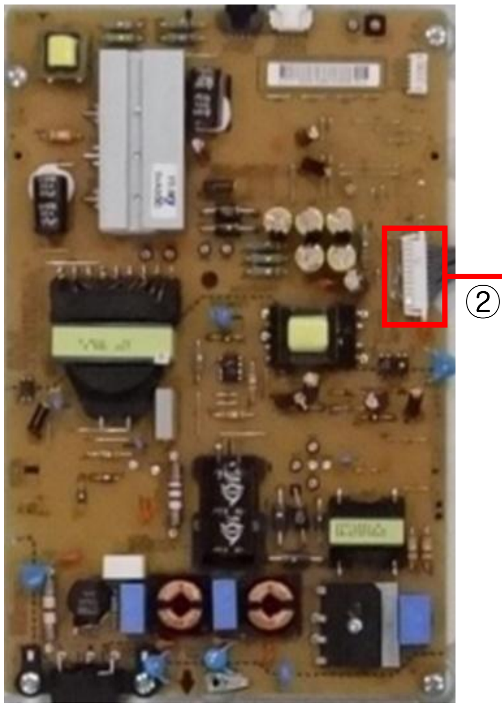
Checking method

1. Press the MENU button on the remote controller
2. Select the SOUND function of the Menu
3. Change TV Sound Out to TV Speaker

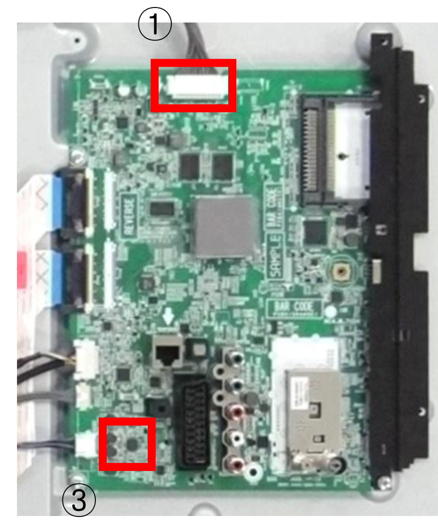
Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	C. Audio error_No audio/Normal video	Established date	2012. 12 .06	
	Content	Voltage and speaker checking method when there is no audio	Revised date		A25

<ALL MODELS>



24 Pin (Power Board ↔ Main Board)			
SMAW200-H24S			
1	Power on	2	Inverter On/off
3	3.5V	4	PWM Dim #1
5	3.5V	6	PWM Dim #2
7	② GND	8	GND
9	24V	10	24V
11	GND	12	GND
13	12V	14	12V
15	12V	16	24V
17	GND	18	GND
19	GND	20	GND
21	GND	22	L/DIMO_VS
23	L/DIM0_MOSI	24	L/DIM0_SCLK



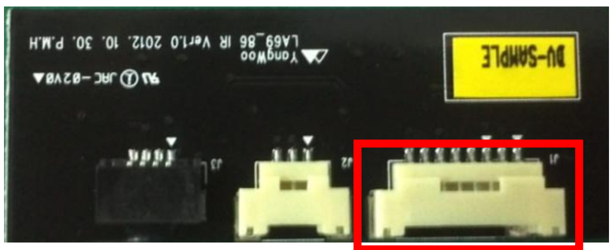
Checking order when there is no audio

① Check the contact condition of or 24V connector of Main Board

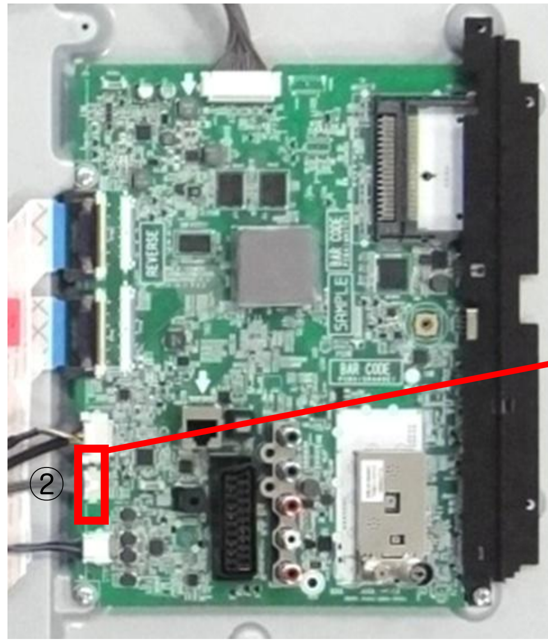
② Measure the 24V input voltage supplied from Power Board
(If there is no input voltage, remove and check the connector)

③ Connect the tester RX1 to the speaker terminal and if you hear the Chik Chik sound when you touch the GND and output terminal, the speaker is normal.

<ALL MODELS>



①



②

P4101	
1	GND
2	KEY1
3	KEY2
③ 4	+3.5V_ST
5	GND
6	LOGO/LED_R
④ 7	IR
8	GND

Checking order

1, 2. Check IR cable condition between IR & Main board.
3. Check the st-by 3.5V on the terminal 4.
4. When checking the Pre-Amp when the power is in ON condition, it is normal when the Analog Tester needle moves slowly, and defective when it does not move at all.

LCD TV	Error symptom	D. VCOM Adjustment	Established date	2012. 12 .06	
	Content	Sequence of the Vcom adjustment	Revised date		A28

1. Case
- LCD module change
- T-Con board change

2. Equipment
- Service Remote controller

3. Adjust sequence
- Press the 'adj' key
- select V-COM
- As pushing the right or the left button on the remote controller, And find the V-COM value Which is no or minimized the Flicker.

(If there is no flicker at default value, Press the exit key and finish the VCOM adjustment.)
- Push the OK key to store the value. Then the message "Saving OK" is pop.
- Press the exit key to finish V-COM adjustment.

